

PERFORMANCE-BASED INCENTIVES WITH FACILITY- AND COMMUNITY-BASED  
HEALTH WORKERS IMPROVE WORKPLACE FACTORS KEY TO PREVENTING  
VERTICAL TRANSMISSION OF HIV IN RURAL MOZAMBIQUE

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by

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PERFORMANCE-BASED INCENTIVES WITH FACILITY- AND COMMUNITY-BASED  
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ABSTRACT

Despite increased access to treatment and reduced incidence, vertical transmission of HIV remains a serious threat to maternal and child health in sub-Saharan Africa. Preventing vertical transmission has received significant attention and funding, initially as a vertical program and more recently as a case study for health systems strengthening initiatives. Performance-based incentives (PBIs) have shown potential to improve quantity and quality of maternal and child health services. However, the pathway by which PBIs lead to improved service delivery has yet to be characterized.

Therefore, the objectives of this dissertation were (1) to characterize the barriers and promoters to prevention of vertical transmission of HIV service delivery in rural Mozambique, where the vertical transmission rate is 12%, (2) to assess the appropriateness for a PBI intervention in this context, (3) to design and implement a longitudinal-controlled proof-of-concept PBI intervention with facility- and community-based workers, and (4) to evaluate the impact of PBIs on health workers' motivation, workplace environment, job satisfaction and intention to leave using a longitudinal, mixed methods approach.

Our theory-based PBI intervention case study found that PBIs increased structured supervision, collegial support, and encouraged bottom-up systems changes. In the context of

donor transitions, PBIs decreased thoughts of leaving among workers at health facilities and buffered against feelings of job insecurity for community volunteers. Implementation was challenged by administrative barriers, disbursement processes, and poor timing of incentives and evaluation measures.

PBIs have the potential to improve key aspects of facility- and community-based health workers' workplace environment. With careful design, implementation, and evaluation, greater impact can be made in reducing the burden of vertically transmitted HIV while improving the experience of delivering health care and supporting health worker retention. Three key areas for future PBI research include more meaningful integration of community-based health workers, performance indicators that capture aspects within health worker control, and mixed methods longitudinal assessments that capture timing of key stages in the PBI evaluation and disbursement process.

## BIOGRAPHICAL SKETCH

Roseanne Schuster's commitment to environmental and maternal and child health have been sharpened through an eclectic array of experiences. An outdoors enthusiast born and raised in Buffalo, NY, Roseanne investigated bioaccumulation of toxins in Great Lakes sportfish during her B.S. in Biology at Canisius College. Struck by the environmental injustice of contaminated food sources, Roseanne worked with Yukon First Nations communities to investigate challenges and adaptations to traditional food security as a Fulbright Scholar. During this research and her MSc in Community Health Sciences at the University of Northern British Columbia, Roseanne's commitment to participatory research and mixed methodologies was firmly established.

Roseanne returned to Buffalo and gained valuable perspectives as a community-based service provider and researcher. As a *doula* (non-medical birth attendant), Roseanne provided nutrition education and birth support to pregnant refugee women and supported the training of *doulas* from Buffalo's respective refugee communities. As Project Manager of a community-based participatory research study at SUNY Buffalo's Department of Family Medicine, Roseanne worked with providers and patients to increase rates of cancer screening among those managing multiple chronic diseases and directed a study on perceptions of cancer screening among refugee communities.

Roseanne began her PhD in International Nutrition at Cornell University in Fall 2011, where she received training to design, implement, and evaluate strategies to support facility- and community-based health workers in delivering of services to vulnerable communities.

Roseanne is returning to environmental health as she starts a post-doctoral research fellowship with the Global Ethnohydrology Study at Arizona State University in Fall 2016, where she will investigate linkages between water, nutrition, and maternal and child health.

## DEDICATION

*“The fact that I was chosen by the pregnant women to help already shows that the women have trust in me. And I try to live up to this trust.”*

~Traditional birth attendant in rural Mozambique

For the millions of clinical and community-based health workers around the world who provide care, support, and comfort to those they attend, while facing their own challenges.

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## TABLE OF CONTENTS

Biographical Sketch	iii
Dedication	iv
Acknowledgements	v
Table of Contents	vii
List of Figures	ix
List of Tables	xi
Chapter 1: Introduction	1
Chapter 2: A comprehensive review of the barriers and promoters health workers experience in delivering prevention of vertical transmission of HIV services in sub-Saharan Africa	16
Chapter 3: Performance-based incentives hold potential to improve delivery of prevention of vertical transmission of HIV services in rural Mozambique	45
Chapter 4: Evaluation of the impact pathway of a performance-based incentives intervention on the delivery of prevention of vertical transmission of HIV services in rural Mozambique	75
Chapter 5: Conclusions	139
Appendix A: Comprehensive literature review search strategy (Chapter 2)	153
Appendix B: Semi-structured interview guide for health workers	154
Appendix C: Community volunteer data collection sheet	157
Appendix D: Motivation, workplace environment factors, and job satisfaction survey	159
Appendix E: Exit interview guide	174
References	177

## LIST OF FIGURES

Fig.1.1. Cascade of facility-based services and maternal behaviors key to preventing vertical transmission of HIV	2
Fig. 1.2 Progression of dissertation chapters for using performance-based incentives to improve delivery of prevention of vertical transmission of HIV services	14
Figure 2.1 Literature search strategy for barriers and facilitators to health workers' delivery of prevention of vertical transmission of HIV (PVT) services	21
Figure 2.2. Integration of the Determinants of Performance and the Motivation-Opportunity-Ability frameworks	22
Figure 3.1. The integrated ecological Motivation-Opportunity-Ability framework for health workers delivering prevention of vertical transmission of HIV services	50
Figure 4.1. Conceptual framework for performance-based incentives intervention with facility- and community-based health workers to increase the quantity of services delivered to prevent vertical transmission of HIV in rural Mozambique	81
Figure 4.2. Data collection timeline throughout the PBI intervention design and 12-month PBI implementation with facility- and community-based health workers in rural Mozambique	93
Figure 4.3. How performance-based incentive funds earned by intervention facilities (n=3) were allocated	102
Figures 4.4a-e. Impact of performance-based incentives on the percent change from baseline for the five incentivized prevention of vertical transmission of HIV service delivery indicators	103
Figure 4.5. Conceptual framework color-coded to show impact of performance-based incentives on facility-based health workers' motivation, workplace environment, satisfaction, and delivery of services	106
Figures 4.6a-h. Graphs of key motivation and workplace environment constructs as responses in mixed effects models, predicted by intervention, time, and intervention*time interaction for health facilities engaged in a performance-based incentive intervention in Mozambique	110
Figure 4.7. How performance-based incentive funds earned by intervention volunteer associations (n=2) were allocated	117

Figure 4.8. Conceptual framework color-coded to show impact of performance-based incentives on community volunteers' motivation, workplace environment, satisfaction, and delivery of services	120
Figures 4.9a-i. Graphs of key motivation and workplace environment constructs as responses in mixed effects models, predicted by intervention, time, and their interaction for community volunteers in a performance-based incentive intervention in Mozambique. Constructs were scored on a 1-5 Likert-type scale	123
Figures 4.10a-h. Job satisfaction, perceived job security, and thoughts and intentions for health facilities and community volunteers engaged in a performance-based incentive intervention in Mozambique	129

## LIST OF TABLES

Table 1.1. Roles and compensation of facility- and community-based (CBHW) health worker cadres involved in preventing vertical transmission of HIV	10
Table 2.1. Key characteristics of studies in review of barriers and promoters to delivery of prevention of vertical transmission of HIV (PVT) services in sub-Saharan Africa	25
Table 2.2. An ecological analysis of frequency of barriers to delivery of prevention of vertical transmission of HIV (PVT) services, by the motivation-opportunity-ability framework (MOA)	34
Table 2.3. An ecological analysis of frequency of facilitators to delivery of prevention of vertical transmission of HIV (PVT) services, by the MOA framework	39
Table 3.1. Description of key services provided by the four health worker cadres preventing vertical transmission of HIV in rural Mozambique and their organizational structure	53
Table 3.2. Characteristics of the health workers who participated in semi-structured interviews, by cadre	58
Table 3.3. Barriers and promoters to delivering prevention of vertical transmission of HIV services according to the ecological MOA framework	60
Table 3.4. Potential for performance-based incentives to address barriers to health workers' delivery of prevention of vertical transmission of HIV services by ecological motivation-opportunity-ability factors	72
Table 4.1. Demographic and health service characteristics of catchment areas for intervention and comparison health facilities prior to implementation of performance-based incentive intervention in rural Mozambique	84
Table 4.2. Quarterly maximum incentive amount per each health facility, district health authority, and community volunteer association in the intervention district of the performance-based incentive intervention	86
Table 4.3. Facility and volunteer association indicators for a performance-based incentive intervention in rural Mozambique	87
Table 4.4. Health workers who participated in the performance-based incentive intervention, by type of data collected, cadre, and intervention status	98
Table 4.5. Demographics for all Mozambican health facility staff and community volunteers who participated in surveys on workplace characteristics, by performance-based incentive intervention status	99

Table 4.6. Proportion of goals achieved by health facilities in the performance-based incentive intervention in Mozambique	100
Table 4.7. Mean percent of goals reached and value of corresponding funds dispersed in the intervention district per quarter	100
Table 4.8 Difference by performance-based incentive intervention status at midline and endline compared to baseline for the five prevention of vertical transmission of HIV services in rural Mozambique	104
Table 4.9. Workplace constructs for facility-based health workers confirmed by factor analysis, by internal consistency (Chronbach's $\alpha$ ) for all workers and by performance-based incentive (PBI) intervention status	105
Table 4.10. Impacts of time and performance-based incentive intervention status on community volunteer's motivation and workplace environment factors, reported as coefficients and standard errors	109
Table 4.11. Percent of goals achieved and corresponding funds earned by Intervention community volunteer associations	116
Table 4.12. Workplace constructs for community volunteers confirmed by factor analysis, by internal consistency (Chronbach's $\alpha$ ) for all workers and by performance-based incentive intervention status	119
Table 4.13. Difference between intervention and comparison community volunteers in motivational and workplace environment constructs at the midline and endline compared to baseline of a performance-based incentive intervention in Mozambique	122
Table 4.14. Difference between intervention and comparison health facilities and community volunteers in job satisfaction, feeling of job security, and thoughts and intention to leave at midline and endline compared to baseline in a performance-based incentive intervention	129

## CHAPTER 1

### INTRODUCTION

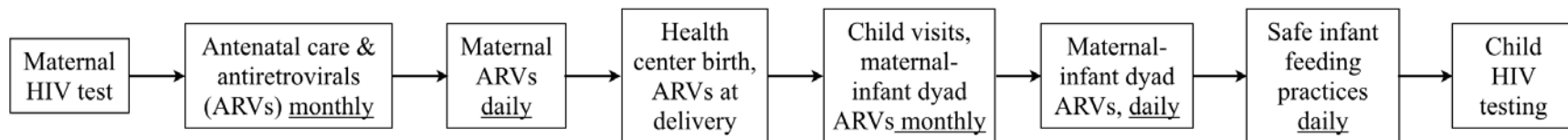
#### **Preventing vertical transmission of HIV**

Knowledge and technology have significantly reduced the morbidity and mortality of pregnant and lactating women living with HIV and that of their breastfed infants, including the risk of contracting HIV (Meessen, Soucat, & Sekabaraga, 2011). HIV/AIDS is responsible for 12% of maternal mortality from pregnancy to one year postnatally in regions where the HIV prevalence is above 2% (Calvert & Ronsmans, 2013). Without intervention, vertical transmission can occur *in utero*, during birth, or during breastfeeding at a collective rate of 25-45% (WHO, 2012b). Maternal-infant dyad antiretroviral therapy and safe infant feeding practices have reduced vertical HIV transmission to less than 5% in breastfed infants in low-resource health systems (Chasela et al., 2010; UNAIDS, 2011).

Treatment regimens have evolved during the past decade in terms of composition of medication and service delivery recommendations. At the initiation of this dissertation, treatment with a triple antiretroviral drug cocktail was advised for all HIV-infected women who met the World Health Organization's (2012) criteria for treatment for their own health (CD4 count  $\leq 350$  cells/mm<sup>3</sup> or clinical Stage 3 or 4), with antiretroviral prophylaxis advised for all other pregnant and lactating women to prevent vertical transmission. Emerging evidence that differentiating between treatment and prophylaxis created implementation challenges at point-of-care and less complicated ART regimens led to the WHO's 2013 recommendation that HIV-infected pregnant and breastfeeding women should initiate lifelong ART and remain on it with the option of ART only during the window of vertical transmission (World Health Organization, 2013). In 2015, following widespread

adoption of the guidelines for all women to initiate lifelong ART and programmatic evidence of successful implementation, the recommendation was for all pregnant and breastfeeding women to be on lifelong antiretroviral treatment (WHO, 2015).

Safe infant feeding practices are exclusive breastfeeding for six months followed by gradual introduction of complimentary foods and continued breastfeeding until one year to reduce HIV transmission and promote overall infant health and survival (Fawzy et al., 2011). Early infant diagnosis with polymerase-chain reaction test and effective antiretroviral treatment within first 6 weeks of life have reduced infant mortality (Lilian, Kalk, Technau, & Sherman, 2013). Collectively, these clinical health services delivered at antenatal, birth, postnatal visits coupled with antiretroviral adherence and safe infant feeding practices are termed prevention of vertical transmission of HIV (Fig. 1.1).



**Fig.1.1.** Cascade of facility-based services and maternal behaviors key to preventing vertical transmission of HIV

However, barriers to the provision and utilization of prevention of vertical transmission services contributed to the 330,000 pediatric HIV infections in 2011, predominantly in Sub-Saharan African nations (UNAIDS, 2012). The drop-out of pregnant and lactating women and their infants along the cascade decrease effectiveness of HIV programs (Basinga et al., 2011; Alexandra Beith, Eichler, & Weil, 2007). The range of demand-side cultural, economic, and psychosocial barriers facing the mother including challenges such as lack of partner support (Ghanotakis & Attiah, 2010; Touré, Audibert, & Dabis, 2010), household and



community stigma (Witter, Fretheim, Kessy, & Lindahl, 2012), distance to the health facility and transportation costs (Fretheim, Witter, & Lindahl, 2012), and other time demands (Magrath & Nichter, 2012). Challenges to maternal ability include challenges in knowledge and self-efficacy (Chivonivoni, Ehlers, & Roos, 2008; Donahue, Dube, Dow, Umar, & Van Rie, 2012; Hardon et al., 2012).

Health facilities present barriers to quality care as well (Laher et al., 2012). Stock-outs (Pasquet et al., 2010), health facility staff shortages and long waiting times (Bwirire et al., 2008), and health workers' lack of empathy and poor patient skills can deter a women from continuing in the cascade. On the supply-side, health workers delivering prevention of vertical transmission services are often overburdened and feel that they do not have enough time to spend with patients (Chinkonde, Sundby, de Paoli, & Thorsen, 2010; Nuwagaba-Biribonwoha, Mayon-White, Okong, & Carpenter, 2007), lack resources such as private counseling rooms and protective equipment (Nguyen, Oosterhoff, Pham, Hardon, & Wright, 2009; Sarker, Papy, Traore, & Neuhan, 2009), do not receive up-to-date regular trainings (Leshabari, Blystad, de Paoli, & Moland, 2007) and may lack clarity around roles and responsibilities (Horwood, Haskins, & Vermaak, 2010a).

Community-based health care workers such as community volunteers and traditional birth attendants hold potential to address existing gaps of drop-out from care and biomedical health worker shortage (Chopra, Sharkey, Dalmiya, Anthony, & Binkin, 2012; Dynes et al., 2013; le Roux et al., 2013). Community-based health workers such as community health workers, community volunteers, and traditional birth attendants are critical in reaching people, particularly those in areas of low population density, of marginalized social groups, and living with stigmatized health conditions (L. Morgan & Eichler, 2011). Systematic task-shifting

strategies have increased the capacity of low-resource health systems to deliver prevention of vertical transmission services by engaging community health workers (Franco, Bennett, & Kanfer, 2002), community volunteers (Audet et al., 2010), and midwives (World Health Organization, 2015). Increases in health worker demands to combat HIV through task shifting have created a dynamic where community-based health workers take on more responsibility without commensurate compensation (Global Health Workforce Alliance WHO, 2014).

Health workers are motivated by a variety of interrelated intrinsic and extrinsic factors. Intrinsic motivation aligns with internally-driven personal values (e.g. interest, enjoyment) and extrinsic motivations respond to forces outside the individual (e.g. sanctions or incentives, approval, conscious valuing of activity) (Kruk et al., 2010). Extrinsic motivators health workers in low-resource health systems include perceived adequacy of wages (Kalofonos, 2014), social recognition, and career development opportunities (Pfeiffer et al., 2010). Furthermore, many other workplace factors affect health workers' ability and opportunity to deliver quality care and prior experiences shape motivation for repeated behaviors (United Nations AIDS Programme, 2014). In sub-Saharan African nations, these factors include workload, organizational efficiency and management strategies, up-to-date training, and overall job satisfaction (Blaauw et al., 2013; Mbindyo:2009en Glenton et al., 2010; Mathauer & Imhoff, 2006; Mbilinyi, Daniel, & Lie, 2011; Mutale, Ayles, Bond, Mwanamwenge, & Balabanova, 2013).

### **Performance-based incentives**

Another strategy to address supply-side challenges to health service delivery in low-resource settings has been performance-based incentives (PBIs). PBIs can be financial or non-financial rewards (e.g. durable goods, social recognition, etc.) for particular actions, either in a

fee-for-service or goal achievement model. In health systems contexts, PBIs seek to target workers' extrinsically-driven motivations, or ones that derive from outside the individual (e.g. compensation, social recognition) (Jahn, Paul, & Beiersmann, 2013).

Results-based financing has been the main vehicle for supply-side PBIs in sub-Saharan African health systems has been and has been implemented in at least 20 countries (L. Morgan & Eichler, 2011). Depending on the scope and context, results-based financing can supplement or replace the health systems' current funding structure and can include the payment of financial incentives to health facilities as a fee-for-service or for reaching targets set. Some of this financing is invested in the health structure and some goes to health workers as salary or bonuses.

The goal of PBIs, including results-based financing initiatives, is to align the motivations of the individuals delivering the services with that of the health system (Jahn et al., 2013) and show results that relate to investment. PBIs involve a contract between a "purchaser" or funder of the health care services, such as the government or a non-governmental organization, and the institution contracted to deliver those services, such as a local (private or public) health facility (Witter et al., 2012). PBIs seek to increase efficiency in service delivery through clearly laid out conditions in the contract and with less micromanagement by funders (Rajkiotia, Zang, Nguimkeu, & Djurovic, 2015).

PBIs of various forms have been used to target the Millennium Development goals related to poverty and maternal and child health (Witter et al., 2012); however their application to prevention of vertical transmission and evaluation of these programs has been limited (Ghanotakis & Attiah, 2010; Touré et al., 2010). Rwanda was an early adopter of results-based financing and successfully implemented it across their entire health system beginning in 2006.

Increases in provision of maternal health services were seen in health facility delivery (23%), preventive care visits by children under 2 years (56%) and 3-5 years (132%) of age, but not in proportions of women completing four or more antenatal care visits (Basinga et al., 2011). Additionally, increases in HIV testing and counseling were reported (de Walque, Gertler, & Bautista-Arredondo, 2013).

### *Engaging community-based health workers in PBIs*

While the importance of community-based health workers is recognized, their potential to respond to PBIs has been under-explored. Community-based health workers have been most engaged in demand-sided PBIs (e.g. vouchers for women to uptake care) as a means to support maternal and child health (L. Morgan, Beith, & Eichler, 2011). After noting that facility performance-based financing was effective in areas of health where providers had more autonomy but less so when patients' decisions were key, Rwanda developed a system-wide community performance-based financing program to target maternal health (Mugeni, Ngabo, & Humuza, 2011). This program initially focused on the demand side (mothers were given in-kind incentives for completing each of three stages of care), but has expanded to the supply (incentives for community-based health workers) as motivation of this cadre was recognized as important. This community performance-based financing program has not been completed nor evaluated. One of the few supply-side only programs to engage community-based health workers incentivized former traditional birth attendants as clinic-affiliated maternal health workers to accompany women to prenatal care and delivery. This program showed increased first antenatal care visit and health facility delivery by nearly 50% and 300%, respectively (Satti et al., 2012).

### *Evaluation for PBI interventions*

Recent evaluations have led to calls for an ethnographic, collaborative, and process-orientated approach to performance-based incentive programs for healthcare delivery. A Cochrane review on supply-side performance-based financial incentives in low- and middle-income countries identified the need for research on the impact pathways of performance-based incentives after it found that variations in scale, context, and rigor were challenges in evaluating overall effectiveness (Witter et al., 2012). This prompted calls for a more detailed and transparent evaluation of performance-based financing process indicators (Fretheim et al., 2012).

Community participation in results-based financing programs has largely been limited to health committees and the contracting of community-based organizations for verification of services delivered with a subset of patients (Falisse, Meessen, Ndayishimiye, & Bossuyt, 2012; L. Morgan & Eichler, 2011). These committees are theoretically granted decision-making rights. However, they tend to only transmit health messages downstream (from health facilities to the community) and self-report poor functioning and confusion regarding their role (Falisse et al., 2012). This gap has prompted calls for the use of ethnographic methods to develop the intervention in close collaboration with stakeholders (Magrath & Nichter, 2012). These above steps, in addition to the monitoring and evaluation of key process indicators such as health care worker motivation, hold potential to improve upon current performance-based incentive intervention design.

## **Research questions**

I propose to use a collaborative and process-oriented PBI intervention to increase quantity of services delivered to prevent vertical transmission of HIV in rural Mozambique and to address our knowledge gaps on how PBIs affect service delivery, their impact on services to

prevent vertical transmission of HIV, and community-based health workers. My research questions for this dissertation are:

1. What are the barriers and promoters that health workers face in preventing vertical transmission of HIV?
2. Are PBIs appropriate to address these barriers to preventing vertical transmission of HIV with both facility- and community-based?
3. How do PBIs lead to changes in the quality and quantity of prevention of vertical transmission services that are delivered?

## **Study Context**

Rural Mozambique is an appropriate place to carry out this research because of its high prevalence and vertical transmission of HIV and its eighth-last rank on the Human Development Index, a measure that integrates a nation's poverty, education, and health (Human Development Report Office, 2013). Nearly half (43%) of Mozambican children are stunted, or low height for age (UNICEF, 2013). Women face gender inequity on many fronts in rural Mozambique, and systemic disparities in education, economics, socio-cultural attitudes, and legal support have been identified as causes of the higher rates of HIV/AIDS afflicting adolescent girls compared to boys (Underwood, Skinner, Osman, & Schwandt, 2011). Mozambican women of reproductive age have an HIV prevalence of 13.7%, and the rate of vertical transmission of HIV is 20.2% (CNCS, 2012). Only two-thirds of eligible HIV-infected women receive prophylaxis and 40.9% of children are tested for HIV at or before two months of age (CNCS, 2012). HIV/AIDS is responsible for 10% of deaths in children under five years of age in Mozambique (UNICEF, 2013).

The Mozambican health system is exploring new strategies to increase effectiveness of financial investments and service delivery. In Mozambique, grants and loans account for 30% of the total national budget and 66% of total health expenditures (WHO, 2012a). Donors across the world are interested in seeing proportional improvements in health for the dollars invested, and there is need and interest in strengthening the Mozambican health system. For example, there is a severe health worker shortage in Mozambique, with the rate of doctors, nurses, and midwives per 10,000 people below the African regional average and far below the WHO's threshold (Global Health Workforce Alliance WHO, 2014). One sign of Mozambique's interest has been the recognition of PBIs as culturally and legally feasible in Mozambique (Connor et al., 2011).

Our study catchment areas and health facilities are described in detail in Chapters 3 and 4. Health workers delivering prevention of vertical transmission of HIV services in this area are the health facility biomedical staff, community health workers, traditional birth attendants, and community volunteers. While *maternal and child health nurses* deliver the majority of prevention of vertical transmission care, all other *facility-based staff* (doctor, technical clinicians, general nurses, preventive medicine agents, and attendants) are involved in this care. Prevention of vertical transmission services are integrated in Mozambique, such that the same maternal and child health nurse treats all women and children regardless of HIV status (Table 1.1). These nurses test pregnant women for HIV, conduct nutrition and health screening, conduct antenatal and postnatal care visits, attend births, and provide counseling on prophylaxis and safe infant feeding. The doctor or technical clinician may see complicated cases and general nurses may substitute for maternal and child health nurses if necessary. Agents are another level of health

workers who support pharmacists and nurses. Data analysts collect and track reporting indicators for the health facilities, which mainly revolve around HIV treatment and tuberculosis. All are paid a monthly salary according to their responsibilities and there is a mix in gender, although maternal and child health nurses tend to be female.

**Table 1.1.** Roles and compensation of facility- and community-based (CBHW) health worker cadres involved in preventing vertical transmission of HIV

	<b>Cadre</b>	<b>Patients (HIV Status)</b>	<b>Role</b>	<b>Compensation</b>
Facility-based	Maternal & child health nurses	Pregnant and lactating women and children (all HIV statuses)	Clinical services (HIV testing for women, children; prophylaxis & treatment; infant feeding)	Monthly salary (\$350) from government
Community-based health workers	Community volunteers	Adults and children (HIV-infected)	Home care; finding loss-to-follow-up patients; counseling on treatment adherence	Small monthly stipend (\$28) from PEPFAR partner
	Traditional birth attendants	Pregnant women (all HIV statuses)	Birth assistance for all pregnant women; mandated not for home delivery	None; Occasional gift from mothers
	Community health workers	Families (all HIV statuses)	Home visits on range of services (sanitation, hygiene, malaria); small focus on HIV/AIDS	Monthly stipend (\$40) from Malaria Consortium

Community volunteers are organized into two co-ed community-based associations; one comprised of HIV-infected individuals that started as a support group for HIV-infected mothers and a second church-based group comprised of mainly HIV-uninfected members. The roles of community volunteers are to 1) visit HIV-infected patients the health facilities identify as lost to follow-up and encourage them to return to the health facility for care and treatment; 2) conduct home care visits for people living with HIV, including encouraging and verifying treatment adherence; and 3) give presentations to the community about HIV prevention and



treatment. The community-based organization is supported by CARE and individual community volunteers are given a small stipend (\$12/month). One of their main challenges is to get patients to health facilities without money for transport for themselves or the patients.

Traditional birth attendants are women who support all pregnant women (HIV-infected, -uninfected, unknown status). Historically in Mozambique they have assisted women in birth in the communities and were remunerated by these women. Traditional birth attendants have varied levels of training; many were chosen by their community to fulfill this role and gained experience assisting others. In the last two decades, the Mozambican Ministry of Health has conducted trainings for traditional birth attendants on safe childbirth practices and have brought traditional birth attendants together in groups to share and learn from each other's experiences. However, these trainings have not regularly occurred and the group meetings have stopped. Furthermore, the spread of HIV has reduced the role of traditional birth attendants in Mozambique; the Ministry of Health now mandates that traditional birth attendants should only support birth at health facilities and not in the community (Ministry of Health, 2009). The Ministry of Health does not provide supervision for traditional birth attendants, but birth attendants in one of our study districts have begun to track births that they attend and report these to their respective community leaders and at one peripheral facility in the other district, they sleep over at health facilities in order to provide additional support to nurses for birthing women. Traditional birth attendants are generally not compensated for their work delivering women at health facilities as health facility delivery is free for women and the Ministry of Health does not provide remuneration.

Community health workers were selected by their communities and trained by the Mozambican Ministry of Health in 2011. Their job is to conduct home visits to provide

education and support to families around water, sanitation, and hygiene, general child health, reproductive health, malaria, and to a limited extent, HIV. They work in an 8-10 km radius around their own home and report to the health facility monthly to pick up supplies. The non-governmental-organization Malaria Consortium has been supporting the community health workers with these supplies and a stipend of approximately \$40/month. Community health workers are both male and female, but more men hold this position.

### **Observational standpoint**

#### *My background informed my research interests and approach*

I initiated my doctoral training after working in the health system on the West Side of Buffalo, NY. Located in an economically poor geographic area, health providers and administrators were struggling to keep up with the increasingly diverse medical and social needs of its incredibly ethnically, culturally, and geographically diverse patient populations. As a *doula* and Birth Coordinator for pregnant refugee women in Buffalo, NY, I saw the challenges pregnant women giving birth in the U.S. for the first time faced in terms of accessing culturally appropriate healthcare and making sense of the new norms surrounding pregnancy and childbirth. At the same time, through volunteering at clinics for newly arrived refugees and managing participatory research initiatives at these health facilities, I saw the constraints health workers along the continuum of maternal and child healthcare faced in terms of juggling local practice norms, emerging evidence-based recommendations, and patient desires, which were sometimes in conflict. I also deep intrinsic motivation to provide excellent care for patients. among these health workers, who spanned the cadres of medical student volunteers, nurses and

physicians at hospitals and private facilities, and Patient Navigators, refugee doulas, and interpreters from the community.

I thus came into my dissertation research in order to better understand the perspectives of pregnant women and their families who seek care in low resource centers. But like my experiences in Buffalo, I was drawn to the health workers in Mozambique, who provide services and care to long lines of patients on a daily basis in a severely limited resource setting. I also tried to bring participatory perspectives to this work, based on recommendations of the literature, my commitment to participatory research, and the mentorship of my committee member Elaine Wethington.

### *My role*

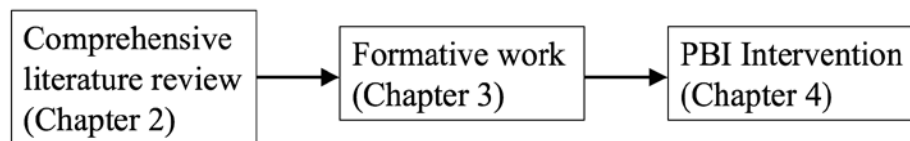
I led the study design, implementation, data collection, and the analysis of results for the PBI intervention. I spent 13 months living and working in Mozambique over its two-year period. I learned and communicated in Portuguese, visited all the health facilities numerous times, and met nearly all of the health workers and actors involved in the health system in these catchment areas at least once.

During the study, I worked closely with my Mozambican counterpart, the CARE International Project Manager, who led the programmatic and logistical aspects, as well as provided invaluable support to the research objectives. Our academic-NGO partnership was inherently and logistically valuable. Inherent institutional differences also raised questions and introduced challenges, including how to resolve differing incentive structures (e.g. reporting objectives, timelines).

## Outline of chapters

My dissertation chapters build upon each other, starting with the comprehensive literature review of barriers to preventing vertical transmission, formative research, and testing of a PBI intervention (Fig. 1.2).

In Chapter 2, we report on a comprehensive literature review on the barriers and promoter's health workers face providing prevention of vertical transmission of HIV services.



**Fig. 1.2.** Progression of dissertation chapters for using performance-based incentives to improve delivery of prevention of vertical transmission of HIV services

We integrated the Motivation-Opportunity-Ability framework (Siemens, Roth, & Balasubramanian, 2008) with the ecologically embedded Determinants of health worker performance framework (Rowe, de Savigny, Lanata, & Victora, 2005) to guide our analysis and structure the reporting of our results. We investigate the use of theory in studies included in our review, which generally aim to address biomedical outcomes and often generate socially-complex conclusions.

In Chapter 3, we applied this novel integrated framework to a specific context in rural Mozambique in order to assess barriers and facilitators health workers face there and assess the appropriateness of performance-based incentives to address some of these challenges. We used semi-structured interviews followed by focus group discussions with the four cadres of facility- and community-based health workers who deliver prevention of vertical transmission services, refining our analyses with this iterative methodology.

In Chapter 4, we detail the study design and results of our PBI intervention and further delve into the pathway by which PBIs lead to changes in quality and quantity of services delivered. This is the first study to longitudinally evaluate the effects of PBIs on health workers' motivation and workplace environment and thoughts of leaving. To our knowledge, this is the first study to engage both facility- and community-based health workers in the same study.

In Chapter 5, we contextualize our findings for evaluation approach and impacts within the various PBI and results-based financing interventions. We synthesize implications for practitioners and suggest new directions for the PBI research.

**N.B.**

I intentionally used the phrase “vertical transmission of HIV” because HIV-infected women have reported that they feel the term “mother-to-child transmission” indicates fault or blame. “Prevention of vertical transmission” is also the direct translation of the Portuguese phrase *prevenção da transmissão vertical* which is used in Mozambique and thus most appropriate for this dissertation.

## CHAPTER 2

### **A comprehensive review of the barriers and promoters health workers experience in delivering prevention of vertical transmission of HIV services in sub-Saharan Africa\***

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## **ABSTRACT**

Despite significant biomedical and policy advances, 199,000 infants and young children in sub-Saharan Africa became infected with HIV in 2013, indicating challenges to implementation of these advances. To understand the nature of these challenges, we sought to (1) characterize the barriers and facilitators that health workers encountered delivering prevention of vertical transmission (PVT) services in sub-Saharan Africa and (2) evaluate the use of theory to guide PVT service delivery. The PubMed and CINAHL databases were searched using keywords barriers, facilitators, HIV, prevention of vertical transmission of HIV, health workers, and their synonyms to identify relevant studies. Barriers and facilitators were coded at ecological levels according to the Determinants of Performance framework. Factors in this framework were then classified as affecting motivation, opportunity, or ability, per the Motivation-Opportunity-Ability framework (MOA) in order to evaluate domains of health worker performance within each ecological level. We found that the most frequently reported challenges occurred within the health facility level and spanned all three MOA domains. Barriers reported in 30% or more of studies from most proximal to distal included those affecting health worker motivation (stress, burnout, depression), patient opportunity (stigma), work opportunity (poor referral systems), health facility opportunity (overburdened workload, lack of supplies), and health facility ability (inadequate PVT training, inconsistent breastfeeding messages). Facilitators were reported in lower frequencies than barriers and tended to be resolutions to challenges (e.g. quality supervision, consistent supplies) or responses to an intervention (e.g. record systems and infrastructure improvements). The majority of studies did not use theory to guide study design or implementation. Interventions addressing health workers' multiple ecological levels of interactions, particularly the health facility, hold promise for far-reaching impact as distal factors

influence more proximal factors. Incorporating theory that considers factors beyond the health worker will strengthen endeavors to mitigate barriers to PVT service delivery.

**Keywords**

prevention of vertical transmission of HIV, health workers, health systems, performance, theory



## INTRODUCTION

Nearly 35 million people are infected with HIV/AIDS globally, of which 71% live in sub-Saharan Africa (SSA) (UNAIDS, 2014b). There, the collective routes of vertical transmission of HIV in utero, during delivery, or during breastfeeding remain a prevalent mode of HIV transmission (UNAIDS, 2014b). Biomedical and policy advances have reduced vertical transmission rates to as low as 1-2% in efficacy studies and under 5% in “real-world” conditions (Chasela et al., 2010; Chi, Stringer, & Moodley, 2013; World Health Organization, 2013). Despite these advances, 199,000 infants and young children in SSA were infected with HIV via vertical transmission in 2013 (UNAIDS, 2014b). If the biomedical and policy innovations to prevent vertical transmission of HIV (PVT) were appropriately implemented, incidence would be lower.

There are significant barriers to PVT on both the provider and beneficiary sides. Three recent reviews have revealed that significant barriers to women’s uptake of PVT services span their many “ecological” levels of interactions (Gourlay, Birdthistle, Mburu, Iorpenda, & Wringe, 2013; Harlaithe, Grede, de Pee, & Bloem, 2014; Tuthill, McGrath, & Young, 2013). However, less attention has been paid to the barriers and facilitators that health workers encounter in delivering PVT services. Yet health workers have been at the center of one of the major solutions to rapidly scale-up PVT services: “task shifting,” or the transfer of specific tasks to less specialized health workers (World Health Organization, 2008). In addition to increasing health system capacity, including the number of community health workers (CHWs), task shifting has created challenges in the health system including how to ensure adequate training, supervision, remuneration, and recognition (Callaghan, Ford, & Schneider, 2010; Mwai et al., 2013).

Strikingly, systematic investigation of health workers' experiences delivering PVT care is lacking.

Furthermore, the use of theoretical frameworks in PVT service delivery has yet to be assessed despite the continued development of health worker-focused theory. Health worker performance literature has progressed from its basis in individual motivational and cognitive theories (Locke & Latham, 2002; Ryan & Deci, 2000) to interpersonal and organizational constructs (Dickin, Dollahite, & Habicht, 2010; Okello & Gilson, 2015). Multi-level frameworks characterizing the complex factors necessary to target facility- and community-based health worker motivation and performance in low- and middle-income countries are increasingly common (Franco et al., 2002; Kok et al., 2014; Naimoli, Frymus, Wuliji, Franco, & Newsome, 2014). However, the degree to which these frameworks are engaged in the research on PVT service delivery is unclear.

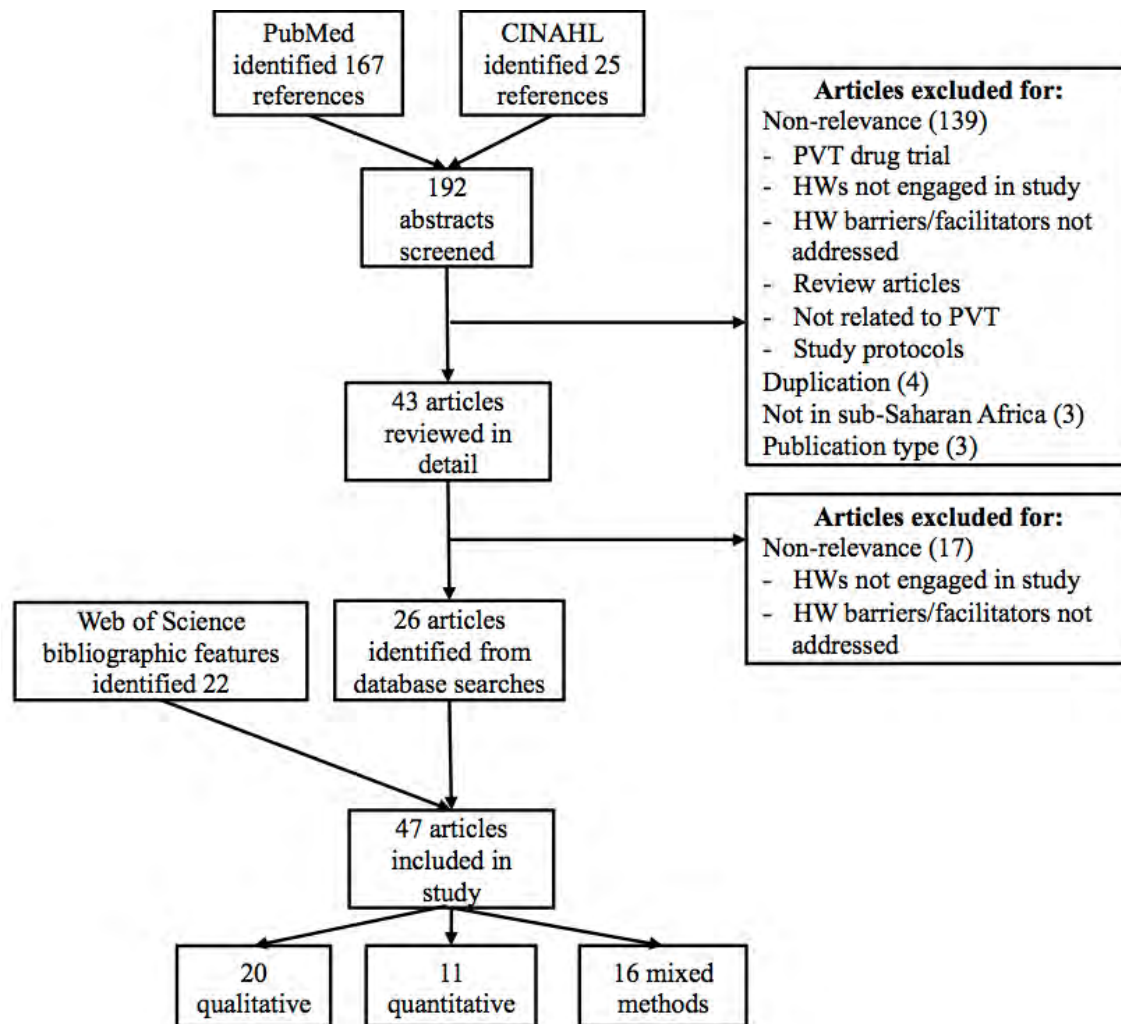
Therefore, the objectives of this literature review were (1) to characterize the barriers and facilitators that health workers encounter in delivering PVT services in SSA and (2) to evaluate the use of theory to guide the design, implementation, and analysis of studies under review.

## **METHODS**

### **Search strategy**

The keywords barriers, facilitators, HIV, prevention of vertical transmission of HIV, types of health workers, and their synonyms were searched in the PubMed and CINAHL databases (Appendix A). The search was limited to studies conducted in SSA and published in English before November 12, 2014. References were imported into Refworks to resolve duplicates and evaluate titles and abstracts.

We initially identified 192 references and reduced this to 26 through the review process (Figure 2.1). Bibliographic features on Web of Science were used to identify additional articles which cited those 26 references. These articles were then reviewed for relevance, yielding an additional 22 articles.



**Fig. 2.1.** Literature search strategy for barriers and facilitators to health workers' delivery of prevention of vertical transmission of HIV (PVT) services

### Data extraction and organization

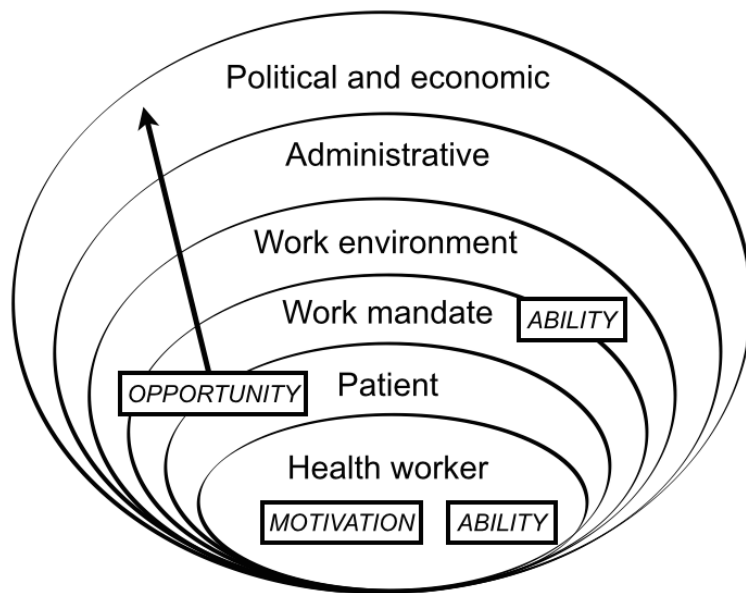
Two co-authors independently extracted study characteristics, overall study findings, barriers, and facilitators. Differences were resolved through discussion. In cases of unclear study

characteristics, the corresponding author was contacted up to two times and the senior author once via email for clarification.

Studies were subdivided by those conducted prior to 2007 and 2007 and later, when the 2006 World Health Organization recommendations for mother-infant dyad treatment and prophylaxis (WHO, 2006a) and IYCF practices (WHO, 2007a) began to be implemented.

### Synthesis of results

Two complimentary frameworks were integrated to guide this synthesis (Fig. 2.2). The first was the Determinants of Performance research agenda which is embedded within an ecological framework (Rowe et al., 2005). The second is the Motivation-Opportunity-Ability framework (MOA), which posits that each of its three domains is necessary for optimal worker performance (Boudreau, Hopp, McClain, & Thomas, 2002; Siemsen et al., 2008).



**Fig. 2.2.** The integrated ecological Motivation-Opportunity-Ability framework for health workers delivering prevention of vertical transmission of HIV services

Determinants of Performance was used as the organizing framework because it places the health worker at the center and moves outwards for a total of six ecological “levels”. The health

worker level focuses on individual factors (e.g. motivation, knowledge, skills). The patient level includes characteristics pertinent at point of care (e.g. patients' severity of illness, demands for inappropriate treatments). The work level encompasses factors directly related to the worker's mandate (e.g. complexity of clinical guidelines), while the health facility environment includes determinants of work environment such as caseload, availability of supplies, and supervision. The administrative environment consists of health system aspects beyond the health facility (e.g. support for supervisors, decentralization). Finally the political and economic environment specifies the educational infrastructure, which we modified to include health worker retention and political commitment.

The MOA was applied to describe health worker performance within each ecological level (Blumberg & Pringle, 1982). Motivation is the health worker's desire and willingness to act and thus predominantly fits within the health worker level. Ability is the capability to execute the action, and its domain overlaps with health worker and some health facility factors. Finally, the opportunity domain consists of the contextual factors that facilitate the action, and thus encompasses all levels beyond the individual.

Barriers and facilitators to delivery of PVT care were coded and organized according to the Determinants of Performance framework, to which iterative modifications were made in response to the presence of specific factors. Articles were then reviewed a second time with the modified framework to identify initially overlooked cases. Following this, factors were classified by MOA domains and ordered by percent of studies reporting that factor. A cutoff of 30% was used to describe "frequently reported" barriers or facilitators. We selected this rather low cutoff as appropriate to convey those barriers and facilitators that were most prominent, as not all

studies evaluated all barriers and facilitators. (Actual frequencies can be seen in Tables 2.2 and 2.3.)

## **RESULTS**

### **Study characteristics**

Of the 47 eligible studies, 20 were conducted prior to 2007 and 27 were conducted in 2007 and later (Table 2.1, displayed at end of Chapter 2). Studies took place in 16 different countries, with South Africa (n=16) the most frequently represented country and southern (n=31) and eastern (n=15) Africa the most represented regions. Studies were most frequently conducted in both urban and rural settings (n=20), followed by solely rural (n=14), urban (n=12), and unclear (n=1) settings. The majority of studies were conducted within the public health system (n=26), followed by both public and private (n=8), community-based (n=3), private only (n=2), and unclear (n=8). Eight studies included community-based health workers such as CHWs or traditional birth attendants (TBAs).

### **Use of theory**

The vast majority of authors did not substantively report using non-methodological theory to guide the design, implementation, or analysis of their study. Exceptions included the expanded health systems approach [Study #24, Table 2.1], a self-developed framework [#36], and Foucault's theory of governmentality [#45]. Nine of the 36 studies that collected qualitative data reported using analytic theories to guide qualitative analysis [#7,9,10,14,15,37,40,44,45].

**Table 2.1.** Key characteristics of studies included in review of barriers and promoters to delivery of prevention of vertical transmission of HIV (PVT) services in sub-Saharan Africa (n=47)

#	Author(s), Year	Year conducted	Country	Setting <sup>a</sup>	Study methodologies <sup>b</sup>	Participants <sup>c</sup>	Objective	Theoretical framework
<i>Studies conducted prior to 2007 (n=20)</i>								
1	Buskens and Jaffe, 2008	2003	Namibia, South Africa, Swaziland	Urban and rural: 11 health centers and hospitals <sup>a</sup>	FGDs, IDIs, participant observation	5 PVT physicians or coordinators, 10 nurses, 7 counselors, 167 mothers, 11 pregnant women, 32 relatives	To explore the perceptions and experiences of mothers and providers on infant feeding counseling in the context of PVT	None
2	Chopra and Rollins, 2008	2003	Botswana, Kenya, Malawi, Uganda	Urban and rural: 29 health centers	FGDs, participant observation, surveys	334 HWs, 640 patients in counseling observations, men and women (34 FGDs)	To assess provider knowledge and quality of infant feeding counseling of PVT programs	None
3	Creek et al., 2007	2003	Botswana	Urban and rural: 12 clinics, 1 maternity hospital <sup>a</sup>	Surveys	66 midwives, 16 counselors, 504 pregnant/postpartum women	To characterize the factors influencing women to accept or refuse an HIV test; to describe what constitutes adequate PVT knowledge for HWs	None
4	de Paoli et al., 2002	2000-2001	Tanzania	Urban: 1 private hospital	IDIs	2 doctors, 16 nurses, 5 counselors	To evaluate the quality and perceived influence of infant feeding counseling on HIV-infected pregnant women	None
5	Delva, 2006	2003	South Africa	Urban: 1 public hospital	SSIs	3 program coordinators, 3 doctors, 1 pharmacist, 7 midwives	To explore the challenges and potential solutions for use of single-dose Nevirapine for PVT	None
6	Doherty et al., 2005	2002	South Africa	Urban and rural: 18 PVT sites <sup>a</sup>	Records review, SSIs	HWs (unspecified)	To evaluate the uptake and performance of South Africa's national pilot PVT program	None

**Table 2.1. continued**

#	Author(s), Year	Year conducted	Country	Setting <sup>a</sup>	Study methodologies <sup>b</sup>	Participants <sup>c</sup>	Objective	Theoretical framework
7	Fadnes et al., 2010	2003-2005	Uganda	Rural: public hospitals, health centers, and NGO projects <sup>a</sup>	FGDs, IDIs, surveys	18 clinical officers, nurses & midwives, HIV-exposed women (7 FGDs), community members (8 FGDs), 727 HIV-uninfected and 235 HIV-infected mothers	To assess delivery of infant feeding counseling; to evaluate the experiences of providers and mothers delivering and receiving this counseling	None
8	Horwood et al., 2010 (B)	2006	South Africa	Urban and rural: public health centers <sup>a</sup>	FGDs	Nurses, mothers and family members	To characterize attitudes and experiences of nurses and mothers during HIV testing in the integrated management of childhood illness	None
9	Ledikwe et al., 2013	2002-2010	Botswana	Urban, peri-urban, and rural: public health centers <sup>a</sup>	counseling observations, client exit interviews, FGDs, IDIs	17 policymakers, 23 district coordinators, 39 HWs (physicians, nurses, midwives, social workers), 400+ lay counselors, 47 patients	To evaluate the effectiveness and contributions of lay HIV counselors	None
10	Leshabari et al., 2007	2003-2004	Tanzania	Urban: 2 public hospitals and 2 public health centers	FGDs, IDIs	25 nurses	To explore experiences and concerns of nurses providing infant feeding counseling in the context of PVT	None
11	Levy, 2009	2004-2005	Malawi	Rural: 1 public clinic	FGDs, longitudinal IDIs, participant observation	21 health personnel (PVT policymakers, aid organizations, medical staff, nurses), 55 HIV-infected women	To characterize women's expectations and experiences of HIV treatment and care	None
12	Malema et al., 2010	2006	South Africa	Urban: 15 public health centers	SSIs	15 lay counselors	To characterize the experience of lay counselors who provide HIV counseling and testing	None



**Table 2.1. continued**

#	Author(s), Year	Year conducted	Country	Setting <sup>a</sup>	Study methodologies <sup>b</sup>	Participants <sup>c</sup>	Objective	Theoretical framework
19	Simba et al., 2008	2005	Tanzania	Urban and rural: 60 predominantly public health centers <sup>a</sup>	Participant observation, records review	435 service providers	To assess the impact of integrating and scaling up PVT into routine MCH services on staff workload	None
20	Wanyu et al., 2007	2002-2005	Cameroon	Rural: community-based	TBA PVT training intervention; SSIs	30 TBAs	To evaluate the effectiveness of TBAs in delivery of PVT care	None
<i>Studies conducted in 2007 and later</i>								
21	Agadjanian and Hayford, 2009	2008	Mozambique	Urban and rural: 6 public health centers	Participant observation, SSIs	2 CHW coordinators, 16 nurses, 4 CHWs	To characterize how integration of PVT services in MCH units shapes provider-client interactions and reproductive choices of HIV-infected women	None
22	Asefa and Mitike, 2014	2010	Ethiopia	Urban: 1 public hospital, 3 public health centers, 2 private hospitals, 2 private health centers	Surveys	31 nurses, midwives, public health officers, and physicians, 423 women seeking ANC	To characterize maternal satisfaction with PVT services and implementation challenges faced by providers	None
23	Chinkonde et al., 2010	2009	Malawi	1 peri-urban and 1 rural public PVT clinic	SSIs, participant observation	5 policymakers, 2 doctors, 8 nurses, 1 lay counselor	To assess policymakers' and HWs' experiences with adapting and implementing global breastfeeding guidelines to national recommendations	None

**Table 2.1. continued**

#	Author(s), Year	Year conducted	Country	Setting <sup>a</sup>	Study methodologies <sup>b</sup>	Participants <sup>c</sup>	Objective	Theoretical framework
24	Doherty et al., 2009	2007	South Africa	Rural: 18 public health centers	Quality improvement intervention; observation, survey, workshops	15 center managers, 35 lay counselors	To evaluate a participatory intervention seeking to improve quality of care in integrated PVT programs	Expanded health systems approach
25	Falnes et al., 2010	2007- 2008	Tanzania	Urban and rural: 5 public clinics	counseling observations, FGDs, IDIs, surveys	5 nurse counselors (IDIs), mothers (in 4 FGDs, 8 IDIs, 311 surveys)	To characterize experiences of mothers and nurse counselors during PVT	None
26	Geelhoed et al., 2013	2009- 2010	Mozam- bique	Rural: 6 public health centers	Integration of PVT services intervention; service delivery statistics, SSIs	70 MCH providers	To assess the viability of integrated PVT care and follow-up of HIV-exposed infants	None
27	Hamela et al., 2014	2008	Malawi	Urban: 4 public PVT sites	TBA training intervention, log review, FGDs	21 TBAs	To evaluate the benefits of incorporating TBAs into HC- based PVT services	None
28	Horwood et al., 2010 (A)	2007- 2008	South Africa	Peri-urban & rural: 1 public health facility & 1 hospital	Surveys	25 nurses, 27 lay counselors, 882 mothers	To evaluate implementation and integration of PVT with MCH. To describe the responsibilities of nurses and counselors	None
29	Israel- Ballard et al., 2014	2008	Kenya	12 public clinics <sup>a</sup>	counseling observations, exit interviews, SSIs	80 mothers, 11 nurses/nutritionists	To evaluate how infant feeding counselors manage challenges encountered in delivery of care	None
30	Kim et al., 2013	2010	Zambia	Urban and rural: 8 military clinics	Observations, surveys	4 medical assistant, 10 clinical officers, 1 pharmacist, 14 nurses, 11 midwives	To evaluate provider performance for PVT and ART care and perception of work environment	None

**Table 2.1. continued**

#	Author(s), Year	Year conducted	Country	Setting <sup>a</sup>	Study methodologies <sup>b</sup>	Participants <sup>c</sup>	Objective	Theoretical framework
31	Kwapong et al., 2014	2011	Ghana	Urban: 5 clinics <sup>a</sup>	FGDs, IDIs, surveys	12 nurses and midwives (IDIs), 40 pregnant women (5 FGDs), 300 pregnant women (surveys)	To characterize health center factors' influence on HIV testing and counseling during ANC to inform implementation	None
32	Labhardt et al., 2009	2007- 2008	Cameroon	Rural: 62 public and private clinics and 8 public hospitals	Supply and equipment intervention; inventory, surveys	102 nurses	To evaluate effectiveness of intervention on equipment availability and staff PVT knowledge	None
33	Lippmann et al., 2012	2007	Malawi	Urban: community based	FGDs	17 TBAs (registered)	To assess the willingness and feasibility of TBAs to provide NVP to infants and mothers	None
34	Mnyani and McIntyre, 2013	2009	South Africa	Peri-urban: 10 public clinics	Surveys	44 nurses, 30 lay counselors, 6 other HWs, 201 HIV-infected women	To assess quality of PVT care via the knowledge and experiences of HIV-infected women and HWs	None
35	Peltzer et al., 2010	2008	South Africa	Urban and rural: 44 public health centers including 5 hospitals	IDIs, register and records review, SSIs	31 program coordinators, 11 health center managers, 8 HWs	To assess challenges and proposed solutions to implementation of PVT care; to assess of clinic registers and health records	None
36	Rispel et al., 2009	2007	South Africa	Urban and rural: 3 hospitals and 20 clinics <sup>a</sup>	IDIs, surveys	20 PVT managers, 9 nurses, 18 lay counselors, 4 maternity staff, 54 TBAs, 47 TMPs, 296 clinic users, 8 community organizations	To assess missed PVT opportunities to inform evaluation of program implementation	Developed framework

**Table 2.1. continued**

#	Author(s), Year	Year conducted	Country	Setting <sup>a</sup>	Study methodologies <sup>b</sup>	Participants <sup>c</sup>	Objective	Theoretical framework
37	Rujumba et al., 2012	2010	Uganda	Rural & peri- urban: 10 public & private hospitals & health facilities	IDIs, observation, SSIs	2 doctors, 3 clinical officers, 15 nurses, 4 counselors	To characterize HW experineces in implementation in order to identify necessary steps to strengthen PVT service delivery	None
38	Sarker et al., 2009	2007	Burkina Faso	Rural: 4 public health centers	counseling observations, IDIs	1 health officer, 1 PVT coordinator, 1 midwife, 6 counselors, 16 pregnant women	To evaluate implementation of opt-in HIV testing services in the context of scaling-up PVT programming	None
39	Shayo et al., 2013	2011	Tanzania	Urban and rural: public and faith based <sup>a</sup>	FGDs, IDIs	22 HWs delivering PVT services, 11 district and regional managers, 10 health center PVT in- charges	To assess the priority setting process in planning the PVT program at district level	None
40	Sprague et al., 2011	2008- 2009	South Africa	1 urban public hospital, 3 peri-urban public health centers	Health records review, IDIs	38 HWs (public health specialists, doctors, nurses, lay counselors), 83 HIV- infected women, 32 caregivers of HIV-infected children	To characterize the barriers for patients and providers in the continuum of PVT care	None
41	Stinson and Myer, 2012	2007- 2008	South Africa	Urban: 4 public primary health centers, 2 public hospitals	SSIs	3 service managers, 9 doctors, 1 nurse, 1 counselor, 28 HIV- infected pregnant and postpartum women	To characterize barriers to initiating life-long ART during pregnancy and challenges to postpartum retention in HIV care	None

**Table 2.1. continued**

#	Author(s), Year	Year conducted	Country	Setting <sup>a</sup>	Study methodologies <sup>b</sup>	Participants <sup>c</sup>	Objective	Theoretical framework
42	Turan et al., 2012	2009-2011	Kenya	Rural: 4 hospitals, 8 health centers <sup>a</sup>	Prospective cluster randomized controlled trial for service integration (HW training)	1,172 HIV-infected pregnant women	To evaluate the effects of integrating HIV treatment into ANC clinics	None
43	Uwimana et al., 2012 (A)	2008	South Africa	Rural: public and private, 4 hospitals, 7 clinics, 5 NGOs	FGDs, IDIs	29 managers, 36 counselors	To characterize managers' and CHWs' perceptions of barriers related to collaboratively implementing TB/HIV/PVT services	None
44	Uwimana et al., 2012 (B)	2008-2009	South Africa	Rural: public and private, 42 hospitals, 5 clinics, 33 NGOs	FGDs, household surveys, IDIs, NGO and health center audits	Health managers, 36 counselors, 3,867 households	To characterize NGO and CHW engagement in and barriers to collaborative implementation of integrated TB/HIV/PVT services	None
45	Vernooij and Hardon, 2013	2008	Uganda	Rural: 1 public clinic	SSIs, observations	2 PVT managers, 2 clinical officers, 2 midwives, 2 counselors, 2 lab techs, 2 CHWs	To elucidate different HW cadres' perceptions and experiences in obtaining informed consent and conducting opt-out HIV testing in the context of PVT	Foucault's theory of governmentality
46	Watson-Jones et al., 2012	2008-2009	Tanzania	Urban: 3 public health centers, 2 public hospitals	Intervention for referrals; ANC observations, prospective cohort of HIV-infected women, surveys	30 HWs, 9 observations, 403 HIV-infected women	To evaluate the drop-out of care of HIV-infected women from the cascade of PVT services; to identify and characterize potential barriers to PVT service effectiveness	None

**Table 2.1. continued**

#	Author(s), Year	Year conducted	Country	Setting <sup>a</sup>	Study methodologies <sup>b</sup>	Participants <sup>c</sup>	Objective	Theoretical framework
47	Yeap et al., 2010	2008	South Africa	Urban and rural: 6 private health centers	IDIs	7 doctors, 5 nurses, 9 counselors, 3 care center staff, 21 caregivers	To describe the barriers and facilitators to uptake of HIV care among children	None

Notes: <sup>a</sup>Unclear breakdown of urban/rural and/or public/private facility numbers <sup>b</sup>Cross sectional unless otherwise noted <sup>c</sup>Some specialized health workers were grouped into general cadres to streamline categorization; e.g. “doctors” included specialists (e.g. pediatricians and obstetricians) and “nurses” included professional and auxiliary nurses **Technical abbreviations:** ART - anti-retroviral therapy; CHW - community health worker; HW - health worker; MCH - maternal and child health; NGO - non-governmental organization; NVP - nevirapine; PVT prevention of vertical transmission; TB - tuberculosis; TBA - traditional birth attendant; TMP - traditional medical practitioner **Method abbreviations:** FGD - focus group discussion; IDI - in-depth interview; SSI - semi-structured interview

## **Barriers to delivery of PVT services**

### *Motivation*

At the health worker level, intrinsic motivation was frequently challenged by stress, burnout, and depression [#1,4,5,8-12,14,21,30,34,35,37,39,40,45,47], as well as the emotional burden that accompanied caring for patients living with HIV [#1,4,8,10,14,15,21,34,37,40,45,47] (Table 2.2). For example, health workers interviewed in Uganda reported high stress from repeatedly counseling young pregnant women following an HIV-positive diagnoses [#14]. Barriers to extrinsic sources of motivation (e.g. dissatisfaction with remuneration [#5,9,10,21,22,34,44], late payment [#40], lack of recognition [#9,12,33]) were reported in comparatively lower frequencies. At the administrative level, 4 of the 15 studies including lay and community-based workers found these cadres were not formally recognized [#12,16,33,44].

**Table 2.2.** An ecological analysis of frequency of barriers to delivery of prevention of vertical transmission of HIV (PVT) services, by the motivation-opportunity-ability framework (MOA)<sup>a</sup>

MOA Domain(s) <sup>b</sup>	Determinant of health worker performance	Manifestation	Studies conducted pre-2007 (n=20)		Studies conducted 2007-on (n=27)		Total studies (n=47)	
			n	%	n	%	n	%
<i>Health worker factors</i>								
M	Intrinsic motivation	Reported stress, burnout, depression	9	45.0%	9	33.3%	18	38.3%
		Emotional burden of work (e.g. frustration of not effecting behavior change, infant HIV infection, patient hostility)	6	30.0%	6	22.2%	12	25.5%
A	Knowledge	Poor understanding HIV transmission paths	7	35.0%	1	3.7%	8	17.0%
		Low general knowledge of health practices	2	10.0%	5	18.5%	7	14.9%
A	Health worker approach to patient interactions	Lack of consideration of patient needs and preferences	4	20.0%	5	18.5%	9	19.1%
		Language barriers between health worker and patient	1	5.0%	0	0.0%	1	2.1%
M	Extrinsic motivation	Inadequate remuneration (incl. late payment)	3	15.0%	5	18.5%	8	17.0%
		Other (e.g. low job security, fear of lawsuits)	2	10.0%	1	3.7%	3	6.4%
		Lack of recognition (incl. few promotion opportunities)	2	10.0%	1	3.7%	3	6.4%
A	Poor self-efficacy	Low confidence in knowledge, interpretation of protocols	2	10.0%	2	7.4%	4	8.5%
		Discomfort diagnosing or counseling woman with HIV	4	20.0%	0	0.0%	4	8.5%
M	Beliefs	Does not practice exclusive breastfeeding personally	2	10.0%	1	3.7%	3	6.4%
<i>Patient factors</i>								
O	Stigma influenced patient behavior at point of care	Stigma, generally (mechanism unspecified)	4	20.0%	10	37.0%	14	29.8%
		Patient hid HIV status during ANC or delivery	1	5.0%	10	37.0%	11	23.4%
		Patient refused HIV testing	3	15.0%	2	7.4%	5	10.6%
O	Patient hid actual (non-adherent) PVT behaviors (e.g. "unsafe" IYCF <sup>c</sup> )		1	5.0%	2	7.4%	3	6.4%
<i>Work factors</i>								
O	Poor referral systems		7	35.0%	15	55.6%	22	46.8%
O	Unclear clinical IYCF guidelines (e.g. lack of existence, awareness) <sup>c</sup>		3	15.0%	7	25.9%	10	21.3%
O	Cumbersome record system (incl. high data volume, poor record-keeping)		0	0.0%	7	25.9%	7	14.9%



**Table 2.2.** *continued*

MOA Domain(s) <sup>b</sup>	Determinant of health worker performance	Manifestation	Studies conducted pre-2007 (n=20)		Studies conducted 2007-on (n=27)		Total studies (n=47)	
			n	%	n	%	n	%
<i>Health facility environment</i>								
O	Over-burdened (e.g. understaffed, high workload, long hours)		12	60.0%	20	74.1%	32	68.1%
A	Inadequate PVT training		13	65.0%	14	51.9%	27	57.4%
O	Lack of supplies (e.g. HIV-specific medicines and tests, other medicines, contraceptives)		11	55.0%	16	59.3%	27	57.4%
A	Incorrect/inconsistent IYCF messages <sup>c</sup>		12	60.0%	8	29.6%	20	42.6%
O	Poor infrastructure							
		Lack of private and appropriately sized spaces for PVT counseling and child delivery	6	30.0%	8	29.6%	14	29.8%
		Inadequate laboratory equipment	0	0.0%	3	11.1%	3	6.4%
		Basics (e.g. water, electricity)	1	5.0%	2	7.4%	3	6.4%
A	Poor supervision (incl. feedback on performance)		4	20.0%	9	33.3%	13	27.7%
O	Inter-cadre issues encountered by lay and community-based health workers							
		Unclear roles	2	10.0%	3	11.1%	5	10.6%
		Poor relations between clinical and lay/community-based health workers	2	10.0%	2	7.4%	4	8.5%
A	Professional isolation		1	5.0%	1	3.7%	2	4.3%
<i>Administrative environment</i>								
O	Poor PVT planning and program coordination							
		Service fragmentation (e.g. separate of PVT and ANC clinics) and poor coordination between them	5	25.0%	8	29.6%	13	27.7%
		Lack of government funding for PVT	3	15.0%	4	14.8%	7	14.9%
		Poor planning for implementation or scale-up PVT	2	10.0%	4	14.8%	6	12.8%
		Poor allocation of equipment and supplies	1	5.0%	2	7.4%	3	6.4%
M	Lack of health system recognition for lay and community-based health workers		2	10.0%	2	7.4%	4	8.5%
O	Foreign donors							
		Donor agenda discordant with country's needs	1	5.0%	3	11.1%	4	8.5%
		Supplies inconsistent	1	5.0%	3	11.1%	4	8.5%
A	Managerial issues							
		Manager did not understand socio-cultural context	0	0.0%	2	7.4%	2	4.3%
		Manager unaware of provincial guidelines	0	0.0%	1	3.7%	1	2.1%
		Did not address health worker concerns; poor communication	0	0.0%	2	7.4%	2	4.3%
<i>Political and economic environment</i>								
O	Health worker turnover, emigration to cities and high-income countries		1	5.0%	5	18.5%	6	12.8%

Notes: <sup>a</sup>The ecological analysis expanded by study are available in Supplemental Table 2a for studies conducted prior to 2007 and in Supplemental Table 2b for studies conducted in 2007 and later <sup>b</sup>MOA Domains: M - motivation; O - opportunity; A - ability <sup>c</sup>IYCF - infant and young child feeding

## *Opportunity*

Health workers feeling chronically overburdened was the most frequently reported challenge overall and occurred at the health facility level [#1,4-7,9-11,14,15,19,20-23,25,26,29-31,34-40,42,43,45-47]. For example, providing PVT services within antenatal care (ANC) increased workload, often without a commensurate increase in staffing [#34], resulting in counselors feeling rushed by long lines and inability to take breaks [#14]. In early roll-out of PVT services, counseling was often provided by nurses moonlighting as counselors, contributing to their overburdened feeling [#4,10]. Other frequently reported health facility challenges included lack of supplies (e.g. PVT-specific medicines [#7,11,16,20,24-26,32,33,36,40], rapid HIV tests [#6,9,26,31,35,36,40,42]), and private spaces for PVT counseling and delivery [#5-7,9,14,15,24,25,31,32,35,37,38,47].

Challenges at the patient and work levels emerged as more problematic in studies conducted in 2007 onwards. Patients reportedly hid their HIV-infected status, e.g. removing identifying stickers from their health card [#6]. Other behaviors at point of care attributed in part to stigma included women's refusal of HIV testing [#14,15,26], skipping counseling sessions [#1,12], and delivering with a TBA [#16,27,33,43,44], although these overlap with sociocultural factors. Poor referral systems resulting in patients lost to follow-up [#1,4,10,11,14,15,20,23,27-31,35-38,40,41,43,44,46], cumbersome record systems [#21,24,26,27,35,36,40], and confusion around clinical IYCF guidelines [#1,17,20,23,24,35,36,38,39,46] were work level factors reported more frequently in studies conducted 2007 onwards.

Administrative challenges were reported slightly more frequently in studies conducted 2007 onwards but less frequently than other ecological levels overall. The most frequently reported barriers were the fragmentation of PVT services

[#1,8,10,11,13,21,23,37,38,40,41,43,46], implications of which include the “de facto segregation” of HIV-infected women that could potentiate stigma [#21], missed opportunities for delivery of PVT services [#40] including IYCF counseling [#23] and family planning and condom usage [#36]. Lack of government funding [#11,14,15,33,37,39,43], poor planning for launch or scale-up of PVT services [#5,10,32,37,38,43], and discordant foreign donor agendas [#7,37,39,44] were reported in lower frequencies and without obvious time trends.

Ambiguity around work roles appeared to be unique to lay and community-based health workers in this review. For example, these cadres reported not feeling respected by clinical health workers [#12,44], and less than one-third of lay health workers had received a written job description in one study [#9]. TBAs were considered an asset to PVT when providing referrals [#20,33,36] but a barrier when conducting unsanctioned home births [#16,27]. TBAs were found to be effective when training, supervision, and referral systems were in place [#20,27].

### *Ability*

Ability challenges occurred at the health worker and health facility levels and tended to be less frequently reported in studies conducted in 2007 and later. The most frequently reported challenges occurred at the health facility and were PVT training identified as inadequate due to its incompatibility with training needs or irregular delivery [#3-5,7-10,12,14-18,21-25,29,32,33,35-37,43,44,47] followed by delivery of inconsistent IYCF messages [#1,2,4,6,7,9,10,14,15,17,18,20,21,23,25,28,35-37,40]. Poor supervision [#5,8,9,12,22,24,30,35-38,43,44], including lack of feedback on performance, was a health facility barrier that was reported slightly more frequently among later studies.

At the health worker level, low knowledge of HIV transmission paths [#2-4,9,14,17,18,36] and poor self-efficacy in diagnosing or counseling patients on HIV [#3,8,9,14] decreased in reported frequency in studies conducted 2007 and after.

### **Facilitators to delivery of PVT services**

Facilitators were reported in lower frequencies than barriers and tended to be resolutions (Table 2.3). Health workers were frequently intrinsically motivated by effecting behavior change and saving lives [#1,4,7-9,12,15,25,45] and less frequently motivated by salary [#30,38], others valuing their work [#21], or professional opportunities [#30].

Facilitators to health workers' ability to provide care included confidence regarding HIV transmission knowledge (health worker level [#34,36,37]) and appropriate training (health facility level [#5,13,15,22,38,45]). Opportunity facilitators at the work level included improvements to record systems [#5,8,24,26], and those at the health facility included consistent supplies [#13,24,36,45] and facility updates [#13,15,26] as well as quality supervision [#5,13,26,30]. Integration of PVT services [#15,23,38] and NGO's technical [#2,15,21,23,44] and financial support [#14,21,45] were facilitators at the administrative level.

Lay and community-based health worker cadres were found to contribute to improved quality and quantity of PVT services [#6,8,9,21,33,38,44]. For example, lay health workers contributed to decreased drop-off of women in the beginning of the PVT cascade [#6], workload for skilled health workers, and HIV stigmatization in the community [#9]. CHWs facilitated PVT through conducting community HIV education [#6,8], leading support groups for HIV-infected women [#8,21,23], and recovering patients considered lost to follow-up [#21].

**Table 2.3.** An ecological analysis of frequency of facilitators to delivery of prevention of vertical transmission of HIV (PVT) services, by the motivation-opportunity-ability (MOA) framework

MOA Domain(s) <sup>a</sup>	Determinant of health worker performance Manifestation	Studies conducted pre-2007 (n=20)		Studies conducted 2007-on (n=27)		Total studies (n=47)	
		n	%	n	%	n	%
<i>Health worker factors</i>							
M	Intrinsic motivation						
	Reward of effecting behavior change, patient health	7	35.0%	2	7.4%	9	19.1%
	Values work	4	20.0%	1	3.7%	5	10.6%
A	Feels knowledgeable about HIV practices	0	0.0%	3	11.1%	3	6.4%
M	Extrinsic motivation						
	Satisfied with remuneration (salary, incentives)	0	0.0%	2	7.4%	2	4.3%
	Others value importance of work	0	0.0%	1	3.7%	1	2.1%
	Professional development opportunities	0	0.0%	1	3.7%	1	2.1%
<i>Patient Factors</i>							
O	Health worker goes out of way to support patient interactions	4	20.0%	3	11.1%	7	14.9%
<i>Work Mandate Factors</i>							
O	Improved record system	2	10.0%	2	7.4%	4	8.5%
<i>Health facility environment</i>							
A	Quality training and regular refresher trainings	3	15.0%	3	11.1%	6	12.8%
A	Quality supervision (e.g. performance feedback, regular meetings)	2	10.0%	2	7.4%	4	8.5%
O	Consistent supplies	1	5.0%	3	11.1%	4	8.5%
O	Good staff relations, sense of teamwork	1	5.0%	1	3.7%	2	4.3%
O	Improved infrastructure						
	Updated equipment and facility	1	5.0%	1	3.7%	2	4.3%
	Private counseling rooms	1	5.0%	0	0.0%	1	2.1%
<i>Administrative environment</i>							
O	NGO support						
	Technical	2	10.0%	3	11.1%	5	10.6%
	Financial	1	5.0%	2	7.4%	3	6.4%
O	Non-clinical cadres delivered PVT services						
	Community health workers	1	5.0%	3	11.1%	4	8.5%
	Lay counselors	2	10.0%	0	0.0%	2	4.3%
	TBAs referred women for clinical PVT care	0	0.0%	1	3.7%	1	2.1%
O	Quality PVT program coordination						
	Service integration for PVT	1	5.0%	2	7.4%	3	6.4%
	Group HIV counseling	0	0.0%	1	3.7%	1	2.1%
<i>Political and economic environment</i>							
O	Political will dedicated to PVT	1	5.0%	0	0.0%	1	2.1%

<sup>a</sup>MOA Domains: M - motivation; O - opportunity; A - ability

## **DISCUSSION**

This theoretically-driven synthesis of 47 studies evaluating PVT service delivery has made it clear that focusing predominantly on the individual-level factors of motivation, knowledge, and self-efficacy, while necessary, is not sufficient to improve delivery of PVT services. The more frequent reporting of barriers and facilitators to intrinsic motivation compared to extrinsic suggests the relative importance of intrinsic motivation to health workers in low-resource settings. Challenges to knowledge and self-efficacy were generally reported less frequently in 2007 and later, potentially reflecting the increased experience of workers in delivering PVT services, effectiveness of early ability-focused interventions, or changes in study objectives over time. Conversely, challenges in the patient, work, and administrative levels were reported slightly more frequently in studies conducted 2007 onwards.

Systematic inquiry is grounded in robust theory, which leads to advancement of knowledge and practice (Friedman, 2003). The absence of theoretical guidance in the majority of studies under review suggests a gap in the regular application of recognized theoretical perspectives in studies focusing on health workers in the context of PVT.

The novel integration of the MOA with the Determinants of Performance framework identified the domains affecting performance within each ecological level of a health worker's delivery of PVT services. The most frequently reported challenges coalesced in the health facility environment level and spanned all three MOA domains. Seven barriers were reported in over 30% of studies; one each at the health worker (motivation), patient (opportunity), and work (opportunity) levels, and four at the health facility environment level (two opportunity, two ability).

The majority of challenges occurred within the opportunity domain. Although addressing these numerous and complex contextual challenges is difficult in the face of severe resource constraints, this strategy has potential to mitigate challenges in other domains. For example, motivation is a complex construct influenced by health workers' own abilities as well as organizational, patient, community, and cultural contexts (Franco et al., 2002). Thus, an approach that incorporates the facility, administrative, and political-economic environments will impact motivation and ability as well.

Implementation science is one such approach that holds promise to close the gaps that result in infant and young child HIV infection. Implementation science systematically incorporates contextual factors across ecological levels into study design and evaluation (Sturke et al., 2014). This has already provided insights into the need for increased focus on administrative factors of leadership, management, and funding (Edwards & Barker, 2014), and interventions using iterative, systems-view approaches have potential to reduce patient drop-off along the PVT cascade (Sherr et al., 2014). Thus, we suggest incorporating implementation science principles into research on delivery of PVT services to more effectively identify and address opportunity challenges.

This review characterized serious bi-directional challenges at the point of care that are influenced by sociocultural trends. Respectful consideration of patients' needs was lacking in one-fifth of studies [#1,8,10,16,21,27,31,40,47]. Documented in maternal healthcare generally (Silal, Penn-Kekana, Harris, Birch, & McIntyre, 2012), this is even more problematic considering the stigma, gender, and socioeconomic vulnerabilities associated with HIV (Ramjee & Daniels, 2013). Furthermore, two studies reported maternal compliance within the PVT

cascade was portrayed as a means for preservation of her child's health [#1,45], contrary to the known benefits of treating a woman for her own sake (Marazzi et al., 2011; UNAIDS, 2014b).

These factors may influence patients' hiding of noncompliant behaviors, which could circumvent women's opportunity to receive appropriate care. For example, fear and psychological distress following an HIV-positive diagnosis influenced women's refusal of HIV testing [#10,14,15,41,46] and the hiding of HIV-infected status later in care [#1,27,33-36,38,43-45,47]. Stigma alone has been shown to impact women's drop-off at every step of the PVT cascade (Turan & Nyblade, 2013). Thus, we propose that practices to mitigate stigma and respectfully approach women should be incorporated into PVT delivery interventions.

Engaging community-based health workers in delivery of PVT was one such strategy found to be effective in this review. Early CHW engagement increases enrollment of HIV-exposed and HIV-infected infants and young children in care (Ahmed et al., 2015) and positively influences exclusive breastfeeding and child growth (Tomlinson et al., 2014). However, this review found lay and community-based health workers' to have unclear status and roles, which can lead to health workers performing tasks outside their training or not living up to expectations. Thus, clear job descriptions, supportive supervisory structures, and formal recognition in the health system are necessary in order to capitalize on these benefits of community-based and lay health workers.

## **Lessons learned**

This comprehensive literature review used two popular databases and generated a strong number of studies for inclusion. While this review has captured published reports likely



reflective of non-peer-reviewed material, there is potential for missed information in organizational reports and documents.

The Determinants of Performance framework was proposed as a research agenda for interventions. Thus, it includes most but perhaps not all potential ecological levels (e.g. sociocultural factors).

Differences in study objectives and methodologies across our 47 articles may have limited the factors reported. For example, the low reported frequency of administrative and political-economic factors may be reflective, in part, of study objectives focusing on more proximal factors. However, this does not mean those factors were not salient, rather perhaps they were not probed (Gourlay et al., 2013). Similar caution should be applied to interpretation of our findings across time groupings.

Finally, community-based health workers were under-represented in our review, which was surprising given their widespread involvement in the PVT cascade. This may reflect their more recent integration into health systems or a gap in research about their experiences. With current global focus on their potential, continued evaluation of community-based health workers is necessary.

## **CONCLUSIONS**

To eliminate vertical transmission of HIV, interventions need to address the multiple ecological levels and contextual factors involved in delivery of PVT services. Individual health worker level barriers may be decreasing. Thus, a focus shift to factors at the health facility and administrative environments holds promise for far-reaching impact, as does meaningful integration of community-based health workers into the health system. Both facility- and

community-based health workers have a role to play in respectfully engaging and retaining women in PVT care and reducing surrounding stigma. Incorporation of implementation science principles into research on delivery of PVT services can illuminate structural opportunity challenges and pathways through which to address them. Research seeking to strengthen the delivery of PVT services should incorporate theory to address factors beyond the individual's motivation and ability when assessing health workers' barriers and facilitators.

## CHAPTER 3

### **Performance-based incentives hold potential to improve delivery of prevention of vertical transmission of HIV services in rural Mozambique**

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## ABSTRACT

**Background:** Performance-based incentives (PBIs) have garnered global attention as a promising strategy to improve healthcare delivery to vulnerable populations. However, literature gaps exist regarding the context in which an intervention is implemented and how the PBIs are developed. Therefore, we (1) analyzed the barriers and promoters to prevention of vertical transmission of HIV (PVT) service delivery in rural Mozambique, where the vertical transmission rate is 12%, and (2) assessed the appropriateness for a PBIs intervention and application to PVT.

**Methods:** We conducted 24 semi-structured interviews with nurses, volunteers, community health workers, and traditional birth attendants about the barriers and promoters they experienced delivering PVT services. We then explored emergent themes from these interviews in 7 subsequent focus group discussions and elicited participant perspectives on PBIs. The ecological Motivation-Opportunity-Ability framework guided our iterative data collection and thematic analysis processes.

**Results:** The interviews revealed that while health workers were motivated intrinsically and by social recognition, they were dissatisfied with low and late remuneration. Facility-based staff were challenged by factors across the rest of the ecological levels, primarily in the opportunity domain, including: poor referral and record systems (work mandate), high workload, stock-outs, poor infrastructure (facility environment), delays in obtaining patient results and donor payment discrepancies (administrative). Community-based cadres' opportunity challenges included lack of supplies, distance (work environment), lack of incorporation into the health

system (administration), and ability challenges of incorrect knowledge (health worker). PBIs based on social recognition and that enable action on intrinsic motivation through training, supervision, and collaboration were thought to have the most potential for targeting improvements in record and referral systems and better integrating community-based health workers into the health system. Concerns about implementation of incentives included neglect of non-incentivized tasks and distorted motivation among colleagues.

**Conclusion:** PBIs have the potential to address key barriers that facility- and community-based health workers encounter when delivering PVT services, specifically by building upon existing intrinsic motivation and leveraging highly valued social recognition. We recommend a controlled intervention to monitor incentives' effects on worker motivation and non-incentivized tasks to generate insights about the feasibility of PBIs to improve delivery of PVT services while minimizing unintended distortions.

### **Keywords**

prevention of mother-to-child transmission of HIV, performance-based incentives, maternal and child health nurses, community health workers, traditional birth attendants, motivation, health systems, Mozambique

## INTRODUCTION

The implementation of evidence-based biomedical practices and policies over the past decade has demonstrated potential to significantly reduce rates of vertical transmission of HIV to as low as 1-2%. The continuum of care to prevent vertical transmission of HIV (PVT) includes maternal HIV testing, prenatal and postnatal antiretroviral therapy (ART) and prophylaxis, safe birth practices, safe infant and young child feeding, and early infant HIV testing (World Health Organization, 2013). However, barriers to this cascade contributed to 199,000 infants and young children becoming HIV-infected in sub-Saharan Africa in 2013 (UNAIDS, 2014b). There, HIV-infected women experience individual, family, community, health systems, and structural barriers that result in their drop-off from each step in the continuum of PVT care (Schechter et al., 2014; Turan & Nyblade, 2013). Simultaneously, health workers face challenges that affect their motivation, opportunity, and ability to deliver PVT services (Schuster, McMahon, & Young, 2016b).

Mozambique experiences significant challenges to both uptake and delivery of PVT services. First, women of reproductive age experience a high prevalence of HIV (16%), fifth-highest among women aged 15-24 globally (CNCS, 2014). Second, despite significant progress over the past decade, coverage of PVT services remains low: only 42% of pregnant women received HIV counseling, testing, and test results during antenatal care (Ministry of Health of Mozambique, 2013) and 35% of HIV-exposed infants were HIV-tested by two months (CNCS, 2014). These drop-offs, and sub-optimal coverage of other PVT services, resulted in 12% of

HIV-exposed Mozambican children becoming infected with HIV in 2013 (UNAIDS, 2014a). Finally, both facility- and community-based health workers deliver PVT services in Mozambique, reflecting the widespread trend of “task-shifting,” or movement of tasks from more to less specialized health workers, in HIV care.

Performance-based incentives (PBIs) have been effective in improving uptake and delivery of health services in low-resource settings. On the delivery side, PBIs are the distribution of money or material goods after a performance target has been achieved and aim to counteract weak health system incentives by aligning rewards with health outcomes (Eichler, Agarwal, Askew, & Iriarte, 2013). Delivery-focused PBIs have increased institutional births and antenatal care attendance (Ashir, Doctor, & Afenyadu, 2013; Eichler et al., 2013), preventative child visits (Basinga et al., 2011), and HIV testing (de Walque et al., 2015). A situational analysis recognized PBIs as appropriate and feasible in the Mozambique and suggested that PBIs could support task shifting, motivate community health workers, and mitigate health facility challenges to service delivery (Connor et al., 2011). However, PBIs have been under-investigated in the context of PVT (Touré et al., 2010).

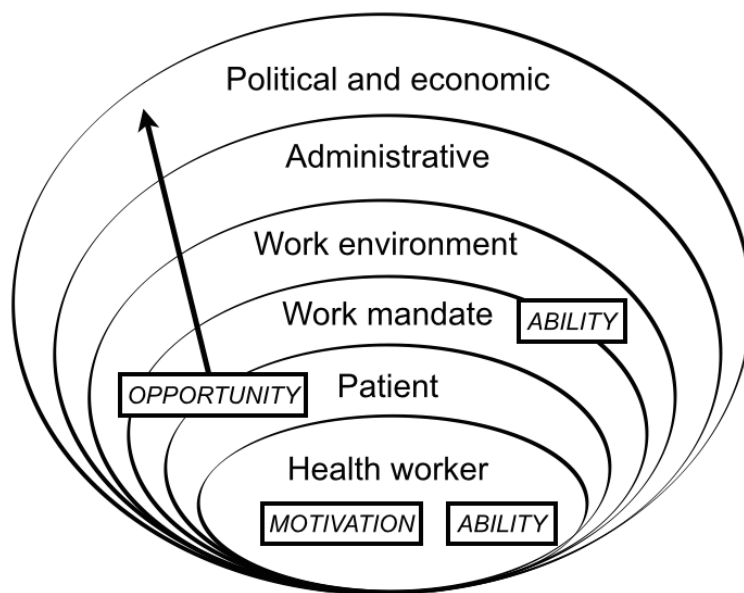
Therefore, we (1) characterized the barriers and promoters experienced by health workers delivering PVT services in rural Mozambique and (2) assessed potential for PBIs to support delivery of PVT services.

## **METHODS**

### **Theoretical underpinnings**

Two complementary frameworks were applied to guide the study design and data analysis (Schuster, McMahon, & Young, 2016b) (Fig. 1). The first was the ecologically

embedded Determinants of Performance framework which places the health worker at the center (Rowe et al., 2005). The second was the Motivation-Opportunity-Ability framework, which is grounded in human resources and operations management (Boudreau et al., 2002). *Motivation* was operationalized as the individual's desire and willingness to act. *Opportunity* encompassed the many contextual factors that enable action beyond the individual. *Ability* included the skills and knowledge to execute action and overlaps with both the individual level and more distal levels of the ecological Determinants of Performance Framework.



**Fig. 3.1.** The integrated ecological Motivation-Opportunity-Ability framework for health workers delivering prevention of vertical transmission of HIV services

### Study setting

Mozambique's legacy of colonization, war for independence (1964-1974), and civil war (1977-1992) left its health system and infrastructure unprepared for the HIV/AIDS epidemic (Audet et al., 2010). Today Mozambique has only 4 physicians and 41 nurses per 100,000 people, far below the regional average (World Health Organization, 2015). Task-shifting initiatives such as training mid-level *técnicos de cirurgia* (surgical technicians) has helped address



the skilled labor shortage for surgical needs (Kruk et al., 2010) but has not alleviated workload of nurses and midwives who deliver PVT services, which are integrated into antenatal care and free to patients (Pfeiffer et al., 2010).

We conducted this research in 2012 in a rural district in northern Inhambane Province, where CARE International was the PEPFAR-implementing partner. The district had a population of 56,000, few maintained roads, and irregular public transportation. In 2012 there were approximately 2,700 pregnancies in the district, with an estimated 53% of births occurring at health facilities (Ministry of Health, 2012). HIV prevalence among pregnant women attending antenatal care was 10.5% (CARE, 2012).

The public health system was comprised of one large district health facility and five peripheral health facilities. The two physicians for the entire district were based at the district health facility. The largest peripheral health facility was led by a mid-level *técnico* and others were led by nurses. At the time of the study, the district and large peripheral health facilities were the only facilities where patients could access ART (when CD4 count  $\leq 350$  cells/mm); only antiretroviral prophylaxis was available at the smaller peripheral facilities. There were no private health facilities or physicians. A number of *curandeiros* (traditional healers) practiced in the district.

Four cadres of health workers provided PVT services within the district (Table 1). Maternal and child health nurses provided the majority of clinical PVT services at health facilities. *Activistas*, or community volunteers, provided home care and counseling to individuals living with HIV/AIDS. Community health workers (CHWs) provided a broad portfolio of health services to households within 10km<sup>2</sup> of their home (Ministry of Health, 2010). CHWs were trained in late 2011 and began working in early 2012. Traditional birth attendants (TBAs) were

not systematically organized or supervised and were generally aware of the Ministry of Health's recommendation that TBAs refer women for health facility care and stop attending home births.

**Table 3.1.** Description of key services provided by the four health worker cadres preventing vertical transmission of HIV in rural Mozambique and their organizational structure

Cadre	Key services	Organization	Receives supervision	Salary	Supported by
Maternal and child health nurses	Antenatal care, birth, children 0-5 years, family planning, and clinical PVT services	Health facilities	Yes	US\$250/month	Ministry of Health, CARE International via PEPFAR
<i>Activistas</i> (community volunteers)	Home-based care, counseling (e.g. treatment adherence, appointment follow-up), linking of patients to clinical care for all HIV-infected individuals	Associations (3 leaders, 20 <i>activistas</i> )	Yes	850MZN/month (~US\$28)	CARE International
Community health workers (CHWs)	Portfolio of health promotion and preventative care (e.g. sanitation and hygiene, malaria, and maternal and child health incl. breastfeeding and family planning, limited HIV/AIDS), limited curative care	Reports to coordinator at health facility	Yes	1,200MZN/month (~US\$40) <sup>1</sup>	Malaria Consortium
Traditional birth attendants (TBAs)	Refer women to health facilities for antenatal care and delivery	Not formally organized	No	Uncompensated	N/A

*Note:* <sup>1</sup>60% of the minimum monthly salary, per government recommendations

## **Semi-structured interviews**

### *Participant selection*

To characterize health workers' barriers and promoters (objective 1), we recruited members of the four cadres for semi-structured interviews. Maternal and child health nurses were purposively sampled based on their role and type of health facility (district, large peripheral, small peripheral). Key informants from two *activista* associations identified *activistas*, who were purposively sampled based on level of engagement. CHWs were identified by their district coordinator and were invited to participate when they visited the health facility to stock-up on supplies. A convenience sample of TBAs attending a training jointly facilitated by the district health authority and CARE International were invited to participate. Sample sizes for each cadre was based upon achieving the saturation needed to outline overarching themes (Guest, Bunce, & Johnson, 2006), with the intent to expound upon these in subsequent focus group discussions.

### *Data collection*

The interview guide contained questions about participants' experiences delivering care to HIV-infected women and their HIV-exposed children, as well as their perceptions of the barriers and facilitators mothers face in uptake of PVT services (Appendix B). The guide was modified for each health worker cadre and pre-tested with the corresponding cadres in a neighboring district.

Two Mozambican research assistants experienced in qualitative research conducted the interviews from September 2012 to January 2013. Interviews were conducted in Xitswa or Portuguese per participant preference and took approximately 60 minutes. Participants were

interviewed in private spaces at health facilities (nurses, *activistas*), in their communities (CHWs), and training site (TBAs).

## **Focus group discussions**

### *Participant selection*

To share, validate, and expound upon early findings from the interviews (objective 1) and assess appropriateness of PBIs for PVT service delivery (objective 2), *activistas*, TBAs, and an array of facility-based health workers were recruited for focus group discussions.

Representatives of each health sector at the district and large peripheral facilities and all staff at the small peripheral health facility were invited to participate because key informants strongly felt that all staff contributed to PVT care. All members of the two *activista* associations were invited to participate. TBAs known to be active in their communities were invited through key informants and snowball recruitment. No focus group was conducted with CHWs because concurrent interviews with HIV-infected mothers did not show women were receiving PVT services from them.

### *Data collection*

We conducted a total of seven focus groups lasting 90-120 minutes in March 2013. Participants were asked about types of incentives, how goals should be set and assessed, and concerns about implementing PBIs. One focus group was conducted at each of the three health facilities (district, large peripheral, small peripheral) in Portuguese. One focus group was conducted with each of the two *activista* associations in Xitswa at their respective meeting locations. A sixth focus group with TBAs was conducted in Xitswa at a community meeting

location. The final focus group was conducted with representatives from each of the three health facilities and two *activista* associations.

### **Participant observation**

The interviews and focus groups were complemented by participant observation conducted at the district, large peripheral, and small peripheral health facilities and *activista* meetings between July 2012 and March 2013.

### **Analysis**

The interviews and focus groups were audio-recorded and accompanied by detailed handwritten notes. The interviews were transcribed into Portuguese and the detailed notes from the focus groups were typed in Portuguese with the support of the audio recording. Transcripts translated into English were coded using the thematic analysis approach (Vaismoradi, Turunen, & Bondas, 2013). Interview results were shared with focus group participants to prompt further discussion, creating an iterative analysis process. Participant observation data was used to triangulate themes and validate findings (Bernard, 2012).

### **Ethics and consent**

Ethical approval was granted by the Cornell University Institutional Review Board (Protocol ID# 1205003043), and letters of support were obtained from the district and provincial health authorities in Mozambique. Participant consent was obtained all interviews and focus groups.

## RESULTS

### Roles in the context of PVT

Of the 24 health workers who participated in interviews (Table 2), nurses and *activistas* reported the greatest involvement in PVT. One nurse summarized, *“My role is to counsel an HIV-infected woman in a way that she will understand that even if she has HIV, the baby can be born without the virus if she follows the recommendations that we give her”* (Nurse 434).

*Activistas* provided in-depth counseling to pregnant women on treatment adherence, inclusive of checking pill bottles and reviewing appointment schedules, and counseled on infant feeding and family planning. CHWs reported that HIV services were a small component of their portfolio and mainly advised uptake facility-based care, adherence to treatment regimens, infant feeding, and family planning. All TBAs advised women on family planning and most advised on breastfeeding, HIV testing, and uptake of prenatal and postnatal healthcare. TBAs saw themselves in a unique position to broker resistance to health facility delivery by accompanying mothers.

**Table 3.2.** Characteristics of the health workers who participated in semi-structured interviews, by cadre (n=24)

Characteristics	Facility-based	Community-based		
	Maternal and child health nurses (n=4)	<i>Activistas</i> (n=6)	Community Health Workers (n=6)	Traditional birth attendants (n=8)
No. female	4	2	2	8
Reason for taking up role	Passion for helping women & children	Own HIV diagnosis; death of loved one due to HIV/AIDS; remote location	Chosen by community, previous work as community health workers	Assisted woman or self in childbirth; worked with facility-based workers
Mean no. years in role or similar (range)	3 (1-7)	3.5 (3-4)	10 (1-21)	15.5 (9-33)
Length of initial formal training	20 months	2 weeks	4 months	Not standard
Frequency of refresher trainings	At least annually	Annually	Annually	Very irregularly
Avg. no. patients/day (range)	26 (10-40)	3.8 (2-5)	11 (6-15)	*
No. receives supervision	4	6	6	0
No. has another job	0	6	4	8

*Note:* \*Traditional birth attendants were unable to quantify their average patient number on a daily, weekly, or monthly basis due to great variability



## **Characterizing barriers and promoters experienced by health workers (objective 1)**

Detailed results were organized according to the integrated ecological Motivation-Opportunity-Ability framework, starting with the most proximal ecological level within each motivation, opportunity, and ability domain (Table 3). Key findings are summarized in the text below.

### *Motivation*

*Health worker: intrinsic motivation.* Nearly all participants were intrinsically motivated to make a difference in their patients' and communities' health (Table 3). HIV-infected *activistas* reported that modeling living healthfully with HIV helped them adhere to their own treatment regimens. CHWs were motivated by their ability to address health concerns in their own households. A few participants across cadres were motivated by continued learning opportunities. All cadres were demotivated by patients not following their recommendations, particularly when this resulted in poor health outcomes.

*Health worker: extrinsic motivation.* All cadres overwhelmingly appreciated recognition from patients, the wider community, and other health workers and were distressed by patient complaints. While the majority of health workers described good inter-cadre relationships, community-based workers were more likely to express concern about how their work was viewed by facility-based workers. Visual identification of roles (e.g. badges) was important to un-uniformed facility-based staff, *activistas*, and TBAs.

All cadres were dissatisfied with the current form, amount, or timeliness of compensation. Nearly all community-based workers held another job, predominantly subsistence farming, to support themselves. While one *activista* and one CHW noted they were happy to receive any monetary compensation for work they had previously performed uncompensated, TBAs were uncompensated for referring women for facility-based care but had previously been compensated for assisting in home deliveries

**Table 3.3.** Barriers and promoters to delivering prevention of vertical transmission of HIV (PVT) services according to the ecological Motivation-Opportunity-Ability framework (MOA)

Barrier (-), promoter (+)		Maternal and child health nurses, with other health facility workers from focus group discussions (FGDs)	Activistas	Community health workers (CHWs)	Traditional birth attendants (TBAs)
Manifestation					
MOTIVATION					
Health worker factors					
Intrinsic motivation					
+	Highly intrinsically motivated	“...when I help the community. It is what my heart wants” (Nurse 483)	“in the community there are no longer many people left living with HIV and without treatment...I feel happy that I attended to and helped [these] people” (Male activista 420)	“I help the people and my family as well. When health problems arise in my house I can resolve the problems more easily” (Male CHW 477)	“I never worked because I wanted money. I first worked because I wanted to help the community and then because I wanted to learn” (TBA 444)
-	Dissatisfied when unable to help patients	“I do not like when difficult situations arise that I cannot solve....There was a case of a woman who had complications in birth. We tried to help but could not. The woman ended up dying” (Nurse 434)	“A negative experience that struck me was a woman who refused to go to hospital and when her son died three weeks after birth” (Female activista 421)	“After some time, the person left [treatment] and the disease worsened...I counseled and the person agreed to go to the hospital...but lost [his/her] life” (Female CHW 478)	Women “refuse” to go to the health facility for delivery, placing TBAs in a compromised position (TBA 446)
Extrinsic motivation					
+	Recognition from patients	“...when people appreciate my work. There was a case of a women that came up to me in [ ] and told me that I had saved her life. I did not even remember her” (Nurse 434)	Good relationship with patients	“The people that I help always thank me and respect me” (Male CHW 482)	“The fact that I was chosen by the pregnant women to help already shows that the woman has trust in me. And I try to live up to this trust” (TBA 450)
±	Recognition from community	“The people acknowledge us” (Nurse 434)	“This patient insulted me, told me to leave, but I did not give up and ended up taking him to the hospital ...he ended up dying. Today [at the funeral]...people said that I helped alot when the patient was sick” (Male activista 422)	“When the person died the family ... said I ...forced the person to go to the hospital, while the family wanted to take him to the healers” (Female CHW 478)	“I like to work because it gives me prestige in the community. I have recognition in my community. And people in my community trust me” (TBA 440)
±	Recognition from other health worker	-	Felt that their work linking patients to care was not valued by facility staff	Concerned that patient non-adherence reflects poorly on their work quality	“When a lot of time has passed between my presence at the health

	cadres				<i>center, they miss me and ask where I have been” (TBA 445)</i>
±	Role identification	Data analyst and lay counselors did not have identification badges to signify their roles at health center (FGD participants)	Want T-shirts, hats, identification cards for work in the community	Had bright green vests	Not always recognized as a TBA when at health facility
-	Patient complaints	<i>“People always criticize our actions. The people say that they are not attended to well. It is complicated when you always receive criticism” (Nurse 483)</i>	Poor reception in homes ( <i>activistas</i> insulted), patient complains <i>activista</i> has not visited often enough	Sick adults questioned why CHW cannot dispense medication to adults (e.g. for malaria)	-
-	Dissatisfaction with remuneration	Salary was low for amount of time spent (including late evenings, weekends); <i>“Wages always arrive late” (Nurse 434)</i>	Subsidy spent on transportation to visit patients and attend meetings, to fix bicycles: <i>“When the 850MT arrives, we have a lot of debt” (Female activista 475)</i>	Subsidy had been delayed several months but had been paid at time of interviews	<i>“A little financial help would be really good, because we work but we do not receive anything” (TBA 444)</i>
<b>OPPORTUNITY</b>					
<b><i>Patient factors</i></b>					
-	Patient behavior circumventing care	<i>“[Retaining women in PVT care] is a big war, because some agree to take the [HIV] test, follow the treatment during their pregnancy, but after the birth...the mother prefers to follow-up for the child and the mother abandons the treatment [for herself]” (Nurse 483)</i>	HIV-infected patient gave wrong address to reception so <i>activista</i> will not be seen at their house	-	<i>“Many women say that they have yet to be full term and then have the baby at home” (TBA 443)</i> TBAs feel obligated when called to assist woman in home delivery, even though they know it is against policy.
<b><i>Work mandate factors</i></b>					
-	Referral systems	Mothers were referred to larger facility for ART without follow-up	Patients returned to care remain on referral list given to <i>activistas</i> ; sometimes received two different referrals for same patient	-	No formal referral system; concerned about breaking confidentiality if refer for ANC before mother is ready for pregnancy to be public
-	Record systems	Paper records (digital for ART patients); nurses share one book (PO); problematic use of mothers’ PVT codes (FGD)	<i>Activista</i> leader compiled visits and services provided from 20 <i>activista</i> members by hand to generate reports	-	Newly implemented system: women reported facility delivery to local TBA, who recorded in a notebook and shared with community leader

<b>Work environment</b>					
±	Workload	<i>"It is hard because we are few; when I am attending to a person and other people are complaining about the wait outside. We do the most we can, but it is a lot of things to do"</i> (Nurse 483)	Time spent was appropriate for volunteer position	Majority felt time spent was appropriate; however, sometimes patients came to their home which interrupted their household duties	-
-	Supplies	<i>"We always have a lack of medicines"</i> (Nurse 434)	Lacked items for conducting home care (e.g. comb, bucket, soap, gloves)	Wanted gloves, scissors, medications for treating adults	Lacked materials to attend to <i>"emergency"</i> birth (e.g. gloves, mask, scissors, gown), flashlight for nighttime travel
-	Infrastructure	Lack of privacy (e.g. child consultations conducted in open air hallways, lack of screens for women in maternity ward), lack of electricity and locks	Lack of office space (for meetings and storage) and equipment (e.g. desk, computer) for report-writing	-	-
-	Distance	-	<i>"What is difficult are the long distances that run between the houses and [being] without any means of transport"</i> (Male activist 420); had bicycles but many now broken and no funds for upkeep	Distance manageable with bicycles but sandy paths were challenging	<i>"It is a long distance to arrive at the health facility....the homes are far away from each other"</i> (TBA 448).
<b>Administrative environment</b>					
PVT service planning and coordination					
+	Efforts to streamline care	Implementation of streamlined <i>"one stop"</i> care and Option B+ (lifelong ART)	-	-	-
-	Processes create delays	Long waits for results for CD4 count (7 days), PCR (up to 6 months) due to analysis at regional and national hospitals; small peripheral facility did not offer ART	-	-	-

-	Lack of incorporation into health system		Individual work linking patients to clinical care not recorded at health facility	-	<i>"The women living with HIV, generally they go to the facility but when they.. abandon care, I don't know [about it]" (TBA 44). TBAs' interactions with health facilities and activities varied widely</i>
Donors					
-	Financial practices differ from local standards	HIV-specific facility-based staff supported by PEPFAR did not receive raise when others did	-	-	N/A

#### ABILITY

##### Health worker factors

Health worker approach to patient interactions

+	Sensitive to patients' opportunity challenges	<i>"We sensitize [newly diagnosed HIV-infected woman] that if she does not have the courage to talk with her husband, we can help" (Nurse 483)</i>	Returned to counsel and care for patients even when verbally abused; encourage feeding complementary foods from farm	Report women experience food insecurity, cost of travel to health center	Discussing family planning: <i>"They see the cost of living each day...if you have a lot of children everything is expensive and it isn't easy to sustain many children...the women don't manage to feed themselves regularly." (TBA 447)</i>
-	Language barrier	One nurse did not know local language at her first posting	-	-	-
Knowledge					
±	Infant & young child feeding (IYCF)	Correct, updated IYCF messages	Mix of correct and incorrect IYCF messages for HIV-infected women	Correct IYCF messages for HIV-uninfected women	Incorrect, outdated IYCF messages for HIV-infected and -uninfected mothers

##### Work environment

±	Training	<i>"It would be helpful for all colleagues to have the same capacity" (Nurse 483); logistical challenges to training all nurses at once, potential for weariness</i>	-	<i>"There are cases of people who abandon [HIV] care, but I don't know how to talk to them because I was not trained in this material" (Female CHW 476).</i>	<i>"I didn't have any training. I worked as an assistant at a local health facility...I learned by observing the births that happened and I began to do them as well, in [nurses'] absence" (TBA 447)</i>
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±	Supervision	Wanted more supervision to support skillbuilding <i>“There are essential elements for good health in the community, we cannot leave anything out”</i> (Nurse 434). Nurses emphasized importance of TBAs to bring women for facility delivery	Wanted more supervision and accompanying recognition	-	Did not report wanting more supervision
±	Collaboration with other cadres	Interactions varied by facility leadership, facility-wide initiatives, and staff size	Sought to work directly with nurses and with neighbors who wield influence	Worked with TBAs, activistas, community leaders in person and via telephone <i>“to harmonize messages”</i> (Male CHW 479)	<i>“It would be important to work with other actors, because that way I could learn from them and I can also teach what I know”</i> (TBA 443)
±	Professional community		Met weekly for reporting; interacted in the field through supervisory visits or visiting patients in pairs	Met regularly or as-needed basis to coordinate activities, depending on community	Interacted at irregularly held trainings
-	Incorrect/inconsistent IYCF messages across health worker cadres who provide care for HIV-infected mothers				

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*Note:* Abbreviations used include FGD - focus group discussion; PO - participant observation; N/A - not applicable; ANC - antenatal care; MCH - maternal and child health

*Activistas* and TBAs reported that additional money would help to offset travel costs to and from patients' homes. However, one highly intrinsically motivated nurse did not believe an increase in remuneration would affect nurse performance:

*"I don't believe that increasing our salary would help improve the activities, because if I say this it means that I am accepting that we are holding back care for some women because we receive little [money]. Financial support could be used to help me as an individual, but it is not a way to improve the activities"* (Nurse 483).

### *Opportunity*

*Patient: behaviors circumventing care.* For nurses, patients not presenting at the health facility, dropping out of care, and non-adherence to treatment challenged their ability to deliver PVT care. Patients who gave false addresses (*activistas*) and called for assistance in already-underway home births (TBAs) challenged community-based cadres.

*Work mandate: poor referral systems.* Current referral systems were problematic for facility- and community-based cadres. Furthermore, lack of a communication system prevented community-based workers from calling ahead or obtaining transportation for an ill patient or a woman in labor.

*Work mandate: cumbersome record systems.* PVT paper record systems were reported and observed to be cumbersome and, at times, inaccurate. Correct and consistent application of a unique PVT code for each HIV-infected mother and HIV-exposed child dyad was problematic and affected ability to monitor and evaluate service delivery and patient drop-out. Similarly, cumbersome reporting systems challenged *activista* associations' monitoring and evaluation,

*Work environment: overburdened.* While *activistas*, CHWs, and TBAs generally felt their time commitments were appropriate, nurses frequently reported being overburdened. They

served long lines of patients daily and then attended patients who presented for critical care after hours, interfering with nurses' own childcare.

*Work environment: supplies.* All cadres reported lacking supplies or wanting additional ones to execute their responsibilities. Most problematic was medication stock-outs for PVT. Community-based cadres lamented they lacked materials to assist in home care (*activistas*), expansion of services to treat adults (CHWs), and kits for attending “emergency” births (TBAs).

*Work environment: infrastructure.* All three health facilities were non-conducive to patient privacy (e.g. lack of screens), two lacked electricity, and one did not have locks or running water. Both *activista* associations lacked their own office space and equipment for report writing.

*Work environment: distance.* Distance was a major challenge to *activistas* and TBAs who traveled to patients' homes and accompanied them to the health facility. For example, *activistas* were frustrated when they traveled long distances to find the patient was not home.

*Administrative environment: PVT planning and program coordination.* Administrative-level challenges for nurses were tempered by planned roll-out of new PVT programs, including the “one stop” strategy to streamline PVT services in mid-2013 and Option B+ to initiate HIV-infected pregnant women on lifelong ART (at the district and large peripheral facility) in 2014. However, at the time of data collection, long waits for CD4 count and PCR infant HIV test results and referral of ART-eligible patients to large facilities were significant challenges to service delivery and retaining women in PVT care. In the community, lack of systematic incorporation of *activistas* and TBAs into the health system resulted in missed opportunities to leverage their motivation and skills.



*Administrative environment: donors.* Discrepancy existed in raises and allowances between positions paid directly by the Ministry of Health and by donors. For example, HIV-specific facility-based workers whose positions were funded through the PEPFAR-implementing partner reported not receiving a raise when other facility-based colleagues did.

### *Ability*

*Health worker: approach to patient interactions.* All cadres were sensitive to their patients' opportunity challenges. Nurses supported women in disclosing their HIV status to their partners and considered maternal finances when counseling on infant and child feeding options. Community-based workers were generally very sensitive to maternal poverty, food insecurity, and distance to the health facility.

*Health worker: knowledge.* Although this study was not designed to evaluate knowledge, health workers discussed the infant and young child feeding messages that they counseled women on. All nurses and some community-based health workers relayed the updated guidelines Mozambique had adopted (WHO, 2010), but some *activistas* and TBAs reported outdated and incorrect messages for HIV-infected women. One TBA reported just learning that attending home births without protection was a potential route of HIV exposure.

*Work environment: training.* Nurses, *activistas*, and CHWs received refresher trainings on an annual basis, and all four cadres wanted more. Few TBAs had attended regular trainings over the decades they had served their communities.

*Work environment: supervision.* Nurses, *activistas*, and CHWs welcomed additional supervision to help them learn and to provide on the job feedback. In addition, *activistas* wanted supervision from the health facility to increase recognition, tying back to extrinsic motivation.

*Work environment: professional community.* Nurse and CHW interactions within their respective cadres varied according to their health facility and community. *Activistas* met weekly, but TBAs reported interacting with other TBAs at irregularly held trainings.

*Work environment: collaboration with other cadres.* All health workers were open to more collaboration to support mothers through the PVT cascade. Intra-cadre collaboration depended on the community leadership and cadre presence in the catchment area.

## **Assessing potential for PBIs to address barriers and build on promoters to delivery of PVT services (objective 2)**

### *Proposed PBIs by cadre*

Maternal and child health nurses and facility-based staff were interested in both personal incentives and reinvestment in service delivery. Suggested individual personal incentives included financial or material rewards such as paid work-related trips to the “best” performing health worker or group. Group incentives that built upon social recognition (e.g. t-shirts and transportation to represent the health facility at district-wide celebrations) were also of interest. Staff proposed reinvesting PBIs in collaborations (e.g. with TBAs, community leaders), social support mechanisms (groups for HIV-infected mothers, fathers of HIV-exposed children), and infrastructural improvements (e.g. increasing patient privacy, attract women to wait ahead of labor) to help retain HIV-infected women and their HIV-exposed children in the cascade of PVT services.

In addition to personal incentives and reinvestment in in service delivery, *activistas* were interested in directing incentives to support sustainability of their associations. *Activistas* proposed using PBIs to build an office for meeting and storage space and to start income-

generating activities. Similar to health facilities, *activistas* sought to use incentives (e.g. lunch, transportation) to support knowledge sharing and coordination of care with other community-based actors. *Activistas* saw opportunities to reinvest incentives in service delivery by repairing bicycles, community engagement (e.g. plays, cooking demonstrations), and facilitating community-health worker collaborations.

TBAs were primarily interested in PBIs as means of individual financial incentives, materials to support their work (e.g. flashlights, telephone credit, transportation), and collaboration with other community-based cadres.

#### *Suggested metrics and concerns for distortions as a result of PBIs*

Suggested metrics for awarding incentives at health facilities included evaluation of staff performance through records and patient ratings of the quality of the care interaction. There was interest in both individual and group metrics; however tracking metrics at the individual health worker level would be difficult with the record systems and reporting practices that were in place. In addition, health facility participants felt that all facility-based workers contributed to clinical PVT care, but tracking PVT indicators would primarily reflect nurse and midwife efforts.

*Activistas* debated whether performance goals should be set at the individual or association level. While all cadres discussed effects on motivation, *activistas* were particularly concerned that awarding PBIs on an individual basis might demotivate their colleagues who did not receive the incentives. *Activistas* were concerned that incentives for particular indicators would detract from their other services.

In contrast to the facility-based workers and *activistas*, TBAs had no interest in setting group goals because they operated individually in their respective communities. TBAs also

found the individual goal-setting problematic because of the variance in number of TBAs and pregnant women in their communities. Like *activistas*, TBAs were concerned with creating competition with their colleagues that would disrupt their collegial relationships.

## **DISCUSSION**

This theoretically-driven evaluation of barriers and promoters of PVT service delivery revealed that health workers were highly motivated but encountered severe opportunity challenges. Facility-based staff were challenged across the ecological Motivation-Opportunity-Ability domains by late payment and uncompensated after-hours work (motivation) and patients circumventing care, poor referral and record systems, heavy workloads, stock-outs, poor infrastructure, and administrative factors (opportunity). We found community-based cadres were dissatisfied with compensation (motivation), challenged by lack of supplies, distance, lack of incorporation into the health system (opportunity), and incorrect and outdated knowledge on infant and young child feeding (ability).

Our findings reflect challenges encountered by facility-based workers elsewhere in sub-Saharan Africa (Keugoung et al., 2014; Sprague, Chersich, & Black, 2011). We expand upon structural barriers of absenteeism and irregular supplies experienced by nurses in northern Mozambique (Geelhoed, Lafort, Chissale, Candrinho, & Degomme, 2013a). In Zambia, health workers' dissatisfaction with salary, poor record systems, work overload, and stock-outs distorted their service values (Topp, Chipukuma, & Hanefeld, 2015). Similarly, a supportive interpersonal environment (e.g. recognition, mentoring, training) followed by adequate infrastructure (inclusive of workload, supplies, equipment) were two key dimensions of facility-based worker satisfaction in rural Tanzania (Mbaruku, Larson, Kimweri, & Kruk, 2014). While

our study found facility-based workers to be highly motivated, further investigation into workers' interpersonal environment and barriers' effects on service values is warranted.

One of the most striking challenges for community-based workers was the lack of integration into the health system, which threatens effective task-shifting. Lack of integration and poor follow-up on their referrals prevents community-based providers' efforts from translating into health impact (Audet et al., 2013; Hamela et al., 2014). In contrast, integrating motivated community-based health cadres can remedy ability and some opportunity barriers (Byrne & Morgan, 2011; Callaghan et al., 2010). This is particularly salient for TBAs who have a wide range of knowledge and training.

Our data suggest that PBIs would be appropriate for addressing the barriers that most cadres encounter across the ecological levels. PBIs are designed to target workers' ability to act on intrinsic motivation (by increasing supervision, support, empowerment) and external motivation (through financial and in-kind rewards) and are structured to address opportunity and ability challenges (L. Morgan & Eichler, 2011). Facility- and community-based cadres reported that they would leverage PBIs for social recognition (worker level: motivation), patient engagement (patient level: opportunity), referral and record systems (work mandate level: opportunity), infrastructure (work environment: opportunity), and collaboration with other cadres and professional community (work environment: ability) (Table 3.4).

**Table 3.4.** Potential for performance-based incentives (PBIs) to address barriers to health workers' delivery of prevention of vertical transmission of HIV services by ecological motivation-opportunity-ability factors

Construct	Potential for PBIs
<b>MOTIVATION</b>	
<i>Health worker factors</i>	
Intrinsic motivation	Limited
Extrinsic motivation	Limited
<b>OPPORTUNITY</b>	
<i>Patient factors</i>	
Patients circumventing care	Very limited
<i>Work mandate factors</i>	
Referral system	Yes
Record system	Yes
<i>Work environment</i>	
Over-burdened	Limited
Supplies	Limited
Infrastructure	Limited
Distance	Very limited
<i>Administrative environment</i>	
PVT planning and program coordination	Yes
Foreign donors	Unclear
<b>ABILITY</b>	
<i>Health worker factors</i>	
Health worker approach to patient interactions	Limited
<i>Work environment</i>	
Training	Yes
Supervision	Yes
Collaboration with other cadres	Yes
Professional community	Yes

Our participants' concerns about implementation of PBIs reflect those in the literature. PBIs can introduce potential for neglect of non-incentivized tasks (Kok et al., 2014), gaming, and other distortions (Spisak & Morgan, 2014). Our findings that collective identity is important to facility- and community-based workers in terms of deciding on incentives and monitoring distortions is a new contribution. For these reasons, careful creation of indicators and strong

monitoring and evaluation systems are necessary to monitor distortions (Spisak & Morgan, 2014). This focus aligns with implementation science and quality improvement approaches, which hold promise to reduce opportunity barriers across the continuum of PVT care (Sturke et al., 2014). At the health systems scale, incentives cannot overcome major structural barriers (L. Morgan & Eichler, 2011). Furthermore, sustainability of PBI initiatives, particularly in donor-funded contexts, remains an understudied concern (Witter et al., 2012). Thus, we find it appropriate for PBIs to be implemented alongside strong monitoring and evaluation programs to address some challenges faced by health workers delivering PVT services, and we recognize that PBIs cannot replace appropriate health system leadership, policy, and investment.

### **Strengths and limitations**

We employed a strong qualitative mixed methods design that led to iterative analysis among the four cadres that deliver PVT services, including often-overlooked TBAs. The use of the ecological Motivation-Opportunity-Ability extended beyond an ecological approach to advance delivery of PVT care (Schuster, McMahon, & Young, 2016b). Finally, we engaged a variety of ground-level stakeholders to assess the context for a PBI intervention, again addressing identified gaps in the literature (Magrath & Nichter, 2012; Witter et al., 2013). A direct outcome of this approach was identifying that TBAs were not comfortable with goal setting, and thus another approach (e.g. per-service PBI model (Satti et al., 2012)), may be more appropriate.

This study may not be generalizable to other regions of sub-Saharan Africa due to the specific history of Mozambique's health system in the context of colonialism, war for independence, and civil war. However, given similarities in motivation and opportunity

challenges across sub-Saharan Africa, this work contributes important perspectives to appropriateness of a touted method to PVT services. The cross-sectional nature of the interviews may have precluded the building of relationships necessary to discuss grave challenges, particularly with the CHWs and TBAs who were not heavily engaged in participant observation. Finally, participant TBAs were likely more linked with health facilities than TBAs who did not participate. However, we anticipate this underestimates TBAs' variance in health facility linkages.

## **CONCLUSIONS**

PBIs have the potential to address key barriers that facility- and community-based health workers face in delivering care to HIV-infected women and their HIV-exposed children, specifically by building upon existing intrinsic motivation and leveraging highly valued social recognition. Therefore, an intervention monitoring the effects of PBIs on health worker motivation, inclusive of incentives for supervision, could lead to important insights about the feasibility of PBIs to improve delivery of PVT services.



## CHAPTER 4

### **Evaluation of the impact pathway of a performance-based incentives intervention on the delivery of prevention of vertical transmission of HIV services in rural Mozambique**

## **ABSTRACT**

Despite increased access to treatment and reduced incidence, vertical transmission of HIV remains a serious threat to maternal and child health in sub-Saharan Africa. Performance-based incentives (PBIs) have shown potential to improve quantity and quality of maternal and child health services. However, the pathway by which PBIs lead to improved service delivery has yet to be characterized. Therefore, we designed and implemented a longitudinal-controlled proof-of-concept PBI intervention with facility- and community-based health workers with three objectives: (1) to test if PBIs increase the number of health services delivered to prevent vertical transmission of HIV, (2) to assess whether and how PBIs affect health worker motivation and key factors in the workplace environment, and (3) to assess if PBIs impact health worker job satisfaction and thoughts of leaving. Our theory-based PBI intervention case study found that PBIs increased collegial support and worker empowerment for both groups as well as structured supervision for community volunteers only. In a time of transitioning funders and implementing partners, PBIs may have buffered against increased frequency of thoughts of leaving in the intervention district and feelings of job insecurity among community volunteers. Implementation fidelity was challenged by administrative barriers, delayed incentive, and poor timing of incentives and evaluation measures. PBIs have the potential to improve key aspects of health workers' workplace environment. With careful design, implementation, and evaluation, greater impact can be made in reducing the burden of vertically transmitted HIV while improving the experience of delivering health care and supporting health worker retention. Three key areas for future PBI research include using performance indicators that more accurately measure worker performance, mixed methods longitudinal assessments that capture timing of key stages in the PBI evaluation and disbursement process, and disclosures of how incentives were used.

## INTRODUCTION

Results-based financing has been cautiously embraced as a strategy to improve delivery of health services in low- and middle-income countries globally, including in sub-Saharan Africa (Meessen et al., 2011). This follows decades of increasing investment in vertical health programs channeled through non-governmental organizations (NGOs) which bypassed rather than strengthened national health systems (Pfeiffer & Chapman, 2015). Health systems with well-functioning service delivery (i.e. the six building blocks of service delivery: health workforce, information, supplies and technologies, financing, and leadership and governance) are recognized as key to achieving health impact (WHO, 2007b). Results-based financing is one approach that seeks to increase accountability and align the motivations of health workers with that of the health system (L. Morgan & Eichler, 2011).

Performance-based incentives (PBIs) is one type of results-based financing. Although PBIs are used interchangeably with *results-based financing*, *performance-based financing*, and *pay for performance* by academics and practitioners (Witter et al., 2013), for this paper “PBIs” will be used to refer to a mechanism whereby incentives are provided to health systems (inclusive of facility and personnel) in addition to existing health systems’ regular funding. “Results-based financing” will be used to refer to restructuring existing health systems financing. Like other forms of results-based financing, PBIs target the motivation of health workers in contexts where salary may be low and the workplace environment may be challenging (e.g. lack of resources, processes, administrative support) (L. Morgan & Eichler, 2011).

Despite recent successes in increasing access to antiretroviral therapy and reducing incidence rates, vertical transmission of HIV remains a serious threat to maternal and child health in sub-Saharan Africa (UNAIDS, 2014b) and is ripe for PBIs (Touré et al., 2010). In that

region 199,000 children born to HIV-infected women contracted HIV in 2013 (UNAIDS, 2014b). Preventing vertical transmission has received large funding and focus, historically as a vertical program and more recently as a case study for implementation science (Rollins & Coovadia, 2013; Sturke et al., 2014) and health systems strengthening initiatives (Rustagi et al., 2016). However, highly contextualized evaluations of PBIs in preventing vertical transmission are lacking.

We therefore sought to investigate if a PBI intervention would be effective at increasing the number of services delivered to prevent vertical transmission of HIV rural Mozambique. In Mozambique, the HIV prevalence is high among women of reproductive age at 16%, women drop out at each step of the cascade of prevention of vertical transmission services, and 12% of children born to HIV-infected mothers contract HIV (CNCS, 2014; UNAIDS, 2014b). In Mozambique and elsewhere in sub-Saharan Africa, community-based health workers have been an increasingly popular strategy to scale up primary care services HIV/AIDS prevention and treatment services (Simon et al., 2009) as recipients of task-shifting, or the transfer of tasks from more to less specialized health workers (Mwai et al., 2013). In the context of HIV/AIDS care, community-based health workers provide specific benefits such as home visits, social support, and combatting stigma in the community (Kalofonos, 2014).

We focused not only on the impacts of PBIs on quantity of prevention of vertical transmission of HIV services but also on the pathways by which PBIs lead to these impacts. This is because pathways for how PBIs improve performance in facility- and community-based contexts is poorly understood. Motivation is assumed to be an intermediary step but has yet to be explicitly mapped on the pathway (Fox, Witter, Wylde, Mafuta, & Lievens, 2013; Witter et al., 2013). A 2012 Cochrane review deemed the impact of results-based financing initiatives as

inconclusive due to differences in design and lack of process analysis on these impact-focused but context-dependent studies (Witter et al., 2012). This led to calls for improved and systematic evaluations (Witter et al., 2013) of which qualitative and participatory methodologies were identified as critical (Magrath & Nichter, 2012).

Furthermore, results-based financing and PBI evaluations have yet to investigate the effects of incentives on workers' intention to leave. The shortage of skilled health workers continues to pose a challenge to health systems in sub-Saharan Africa, of which retaining health workers is an important component of the remedy. As high as 20% and 10% of African-born physicians and nurses, respectively, worked overseas in 2000 (Kalipeni, Semu, & Mbilizi, 2012), with more migrating to other countries in Africa or leaving the public health systems for NGO and private sector work (Sherr et al., 2012). This turnover translates into a lost investment of the time and money required to recruit and retrain new workers and interrupts service delivery, potentially decreasing quality and quantity of services on the continent (WHO, 2006b).

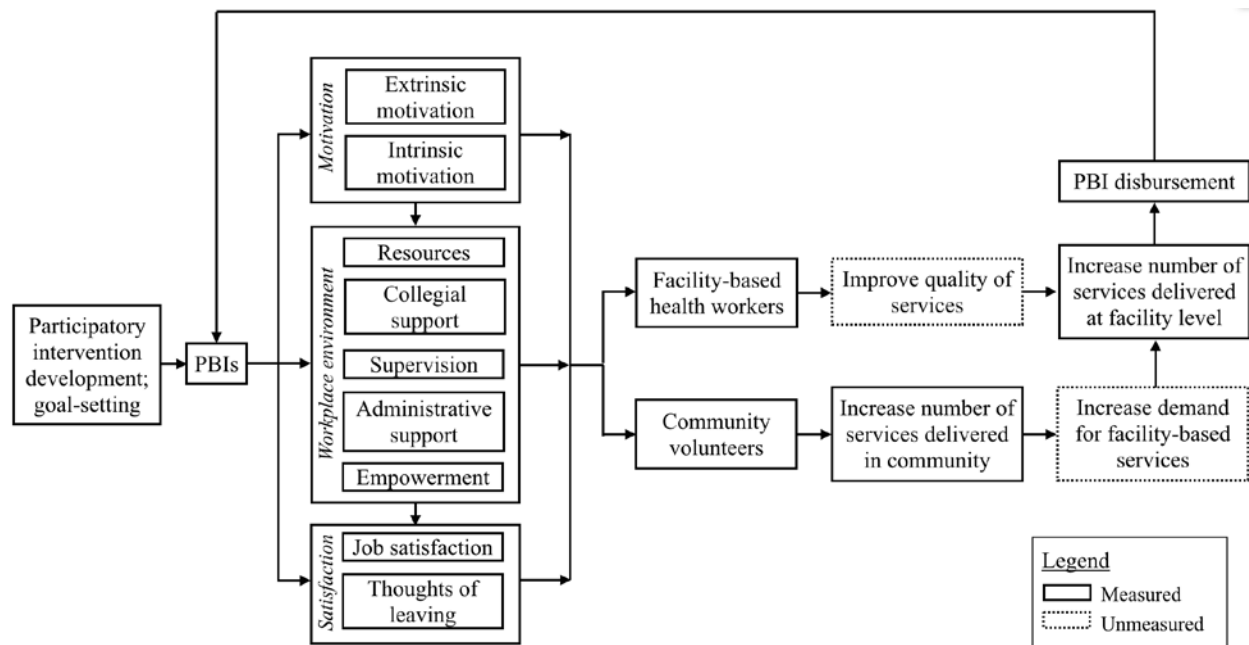
Therefore, we implemented a proof-of-concept intervention with facility-based health workers and community volunteers in rural Mozambique with three objectives. The first was to test if PBIs increase the number of health services delivered to prevent vertical transmission of HIV. The second and third pertain to the pathways by which PBIs may impact service delivery: to assess whether and how PBIs affect health worker motivation and key factors in the workplace environment and to assess if PBIs impact health worker satisfaction and thoughts of leaving their position in the next year.

## **METHODS**

## Conceptual framework

Engaging stakeholders in the intervention design, and specifically health workers participating in goal-setting, is key to effectively targeting health worker motivation (Locke & Latham, 2002) and is the starting point for our intervention's conceptual framework (Fig. 4.1). PBIs are hypothesized to work through increasing health workers' extrinsic motivation, or motivation driven by factors outside the self (e.g. remuneration, social recognition) to lead to a desired action. PBIs also directly affect other aspects of a health worker's workplace environment, such as collegial support, supervision, empowerment, resources, job satisfaction and administrative support (L. Morgan & Eichler, 2011). These constructs and motivation have a bidirectional relationship. For example, high or low levels of these constructs may affect motivation and, in turn, changes in motivation may affect workers' levels of collegial support offered. Together, motivation and workplace factors modify the effect of PBIs on the outcomes of interest.

Our intervention involves both facility-based health workers and community volunteers. We hypothesize that PBIs will increase number of services that volunteers deliver, of which referral for facility care is a main component, and therefore increase demand for facility-based services (Fig. 4.1). We hypothesize that PBIs with facility-based workers will help workers to improve quality of service delivery and lead to increased number of services delivered at the facility. Due to resource limitations, we did not measure quality of facility-based services delivery or track if patients visited by a volunteer engaged in facility-based care. We linked the disbursement of PBIs back to the PBIs as the incentive at the beginning of the model because we hypothesize that experiences of prior outcomes affect continued engagement, just as past health care delivery experiences generally influence effort exerted (Franco et al., 2002).



**Fig. 4.1.** Conceptual framework for performance-based incentives intervention with facility- and community-based health workers to increase the quantity of services delivered to prevent vertical transmission of HIV in rural Mozambique

## Study setting

This research took place in Mozambique, a southeastern African nation with a weak health system following a legacy of colonialism, war for independence (1964-1974), and civil war (1977-1992) (Audet et al., 2010). Mozambique has a shortage of skilled health workers, with only 4 physicians and 41 nurses and midwives per 100,000 people in 2013, far below the regional average for sub-Saharan Africa (World Health Organization, 2015) and even further below the WHO minimum threshold of 230 skilled health workers/100,000 people (Global Health Workforce AllianceWHO, 2014). Initiatives to address this shortage and scale up services to meet patient needs have included training mid-level *técnico de cirurgia* (surgical technicians) (Kruk et al., 2010) and community volunteers who provide social support and link patients with facility-based care (Kalofonos, 2014).

In Mozambique, prevention of vertical transmission services are integrated into maternal and child health services (Pfeiffer et al., 2010). Women of reproductive age have the fifth-highest prevalence of HIV globally and drop-off of vertical transmission services at every step in the cascade (United Nations AIDS Programme, 2014).

This research was conducted from July 2012-August 2014 in two districts in northern Inhambane Province. In Mozambique, the Provincial Health Directorate manages the health system from the capital city in each province. Districts are smaller administrative subunits, and each has a District Health Authority with limited autonomy in decision-making that manages local programs (Pfeiffer, 2003). The district health authority is led by a health director and may have a small staff including financial officer and administrative assistant.

During the formative work and intervention design (July 2012- July 2013), CARE International was the PEPFAR-implementing partner for health facilities and community volunteer associations, providing financial and technical support for HIV prevention and treatment. During intervention implementation (August 2013-July 2014), the Center for Collaboration for Health, a Mozambican NGO new to the districts, had transitioned into the role of the PEPFAR-implementing partner.

The intervention district was selected based on perceived readiness by CARE and interest by the District Health Authority. Three health facilities (the district facility, large peripheral, and one small peripheral facility) were selected for implementation of the PBI intervention (Table 4.1). The comparison district was matched based on geographic and administrative similarities, and three facilities in this district were matched for similarities in their catchment areas and workforce. Two community volunteer associations in the intervention district and one in the comparison district were also engaged in the PBI intervention,



The district facilities were led by a physician, peripheral facilities by a nurse, and the large peripheral facility in the intervention district by a mid-level *técnico*. At the time of the study, patients could only access ART (when CD4 count  $\leq 350$  cells/mm) at the district and large peripheral facilities; only maternal-infant dyad antiretroviral prophylaxis was available at the small peripheral facilities and so eligible patients were referred to the district or large peripheral facilities for ART. Paper-based record systems were used to document PVT service delivery, although women on ART at the district and large peripheral facilities were included in an electronic database supported by PEPFAR.

Four cadres of health workers provided PVT care in these districts. Maternal and child health nurses and midwives provided the majority of facility-based PVT services. Members of community-based volunteer associations (*activistas*) provided home care and counseling to individuals living with HIV/AIDS. Community health workers provided some HIV prevention education, which was a small part of their large health promotion and prevention portfolio. Traditional birth attendants historically attended home births but increasingly referred women to facilities for birth. In addition, a number of traditional healers (*curandeiros*) but no private health facilities or physicians practiced in the districts.

**Table 4.1.** Demographic and health service characteristics of catchment areas for intervention and comparison health facilities prior to implementation of performance-based incentive intervention in rural Mozambique

	<b>PBI (Intervention) District</b>			<b>Comparison District</b>		
	<b>District facility</b>	<b>Lg. peripheral facility</b>	<b>Sm. peripheral facility</b>	<b>District facility</b>	<b>Lg. peripheral facility</b>	<b>Sm. Peripheral facility<sup>a</sup></b>
<b>Demographics</b>						
Population in catchment area <sup>b</sup>	22,296	25,083	2,899	7,904	7,303	
Population of women of reproductive age in catchment area <sup>b</sup>	4,437	4,992	577	1,573	1,461	
No. women eligible for prenatal care <sup>b</sup>	1,115	1,254	145	395	367	
Mo. mean all pregnant women new to prenatal care (July 2012-Jun 2013)	85.9	53.7	11.6	56.5	16.4	4.5
Est. mo. mean no. HIV-infected pregnant women eligible for PTV care <sup>c</sup>	117.1	131.7	15.2	37.5	34.9	
Mo. mean HIV-infected pregnant women new to prenatal care (July 2012-Jun 2013)	17.8	10.5	1.5	10.9	2.3	0.8
<b>Health facility services</b>						
Measures CD4	Yes	Yes	No	Yes	No	No
Offers antiretroviral prophylaxis	Yes	Yes	Yes	Yes	Yes	Yes
Offers antiretroviral therapy (ART)	Yes	Yes	No	Yes	No	No
Maternity services	Yes	Yes	Yes	Yes	Yes	Yes
<b>Health care workers in catchment area</b>						
Facility-based staff MCH = maternal and child health	52 staff including: 2 doctors, 5 technical clinicians, 9 general and <b>4 MCH nurses, 4 midwives</b> , 2 HIV counselors, 1 data analyst, 9 janitors	22 staff including: 4 technical clinicians, 2 general nurses, <b>6 MCH nurses</b> , 2 HIV counselors, 1 data analyst, 4 janitors	4 staff including: 1 general nurse, <b>1 MCH nurse</b> , 1 pharmacist, 1 janitor	30 staff including: 2 doctors, <b>3 MCH nurses</b>	4 staff including: 1 technical clinician, 1 nurse, <b>1 MCH nurse</b> , 1 janitor	2 staff including: <b>1 MCH nurse</b> , 1 janitor
# clinical staff to 10,000 population	10.8	4.8	6.9		4.1	
Community volunteers	33	3	2	10	0	0
Community health workers	8	10	2	4	4	2
Traditional birth attendants	10	2	0	2	6	1

<sup>a</sup> Data missing for this small peripheral facility <sup>b</sup> Based on Ministry of Health data and goals for each health facility <sup>c</sup> Number of women eligible for prevention of vertical transmission services based on estimate of 10.5% HIV prevalence among women of reproductive age in PBI intervention district and 9.5% in the comparison district

## Study design

The joint research and implementing team used a participatory approach to the intervention design. We started with an 8-month formative assessment of the barriers health workers experience in delivering prevention of vertical transmission of HIV services and the appropriateness of PBIs to address them (Schuster, de Sousa, Rivera, Olson, et al., 2016a). Following the formative assessment, repeated meetings with intervention health centers, district authorities, volunteer associations, and health system implementing partners were held to discuss, debate, and develop the intervention approach. The intervention district's senior health administrator also visited another district in Mozambique with an on-going results-based financing intervention to learn about challenges and facilitators to implementing it.

We describe the PBI intervention with the facility-based health workers and with the community volunteers separately for clarity about the incentives, indicators, and evaluations specific to each group. However, we emphasize that these two interventions are linked as their shared goal is to increase number of facility-based services delivered.

### *Facility-based performance-based incentives*

The three intervention facilities were engaged in goal-setting and were eligible to receive PBIs based on goal attainment. The three comparison facilities were engaged in goal-setting alone.

*Incentives.* The total budget for facility-based incentives was US\$18,000 (540,000 MZN) or \$4,500/quarter. The quarterly budget was approximately  $\frac{1}{4}$  of each worker's monthly salary, so that over the year of implementation the maximum financial incentive would be equivalent to one month's salary for all health workers. This quarterly budget was allocated to the three

intervention facilities in proportion to the number of workers and their respective salaries at the time of the intervention planning phase (Table 4.2). For reference, a nurse's monthly salary at the time of intervention planning was US\$350.

Five percent of health facility incentives (US\$900) was available for district health authority over the course of the intervention to engage the District Health Authority through accountability and administrative support. These incentives would be allocated based upon the mean percent of goals achieved each quarter across the facilities.

**Table 4.2.** Quarterly maximum incentive amount per each health facility, District Health Authority, and community volunteer association in the intervention district of the performance-based incentive intervention

<b>Unit</b>	<b>Number of health workers</b>	<b>Available incentives per quarter (US\$)</b>
District health facility	52	\$2,910.00
Large peripheral health facility	22	\$1,250.00
Small peripheral health facility	4	\$340.00
<i>Facility sub-total</i>	<i>78</i>	<i>\$4,500.00</i>
<i>District health authority</i>	<i>5</i>	<i>\$225.00</i>
Association 1	23	\$825.00
Association 2	23	\$825.00
<i>Association sub-total</i>	<i>46</i>	<i>\$1,650.00</i>
<b>Total quarterly incentives</b>	<b>129</b>	<b>\$6,375.00</b>

*Goal setting.* Five facility indicators that represent the span of the prevention of vertical transmission service cascade were chosen as the facility indicators (Table 4.3). Indicators that captured key points in the cascade (e.g. antenatal care, institutional delivery, and child follow-up visits) and that did not detract from services for HIV-uninfected women were consciously chosen. Thus, first antenatal care visit and facility delivery were included for both all women and HIV-infected women. Furthermore, these indicators were familiar to all facilities as they were also indicators used for facility-specific goals set for the district by the province.

Facility-specific goals for each indicator were set by taking the monthly mean for each indicator over the previous year and increasing by 10%. Setting goals as a proportion of baseline measures builds on existing capacity and has been used in other PBI initiatives (Spisak et al., 2016). This approach was also selected in order to create challenging but realistic goals; goals currently set for the districts by the province were already being met by some facilities and were unattainably high for others.

Thus, the proportion of goal achieved was used as the metric in order to scale for facilities with differently-sized patient populations. As such, a facility reached 0% of the goal if they reported the baseline monthly mean and 100% if they reached the goal. Possibilities for reported percent change from baseline could be negative, partial, and greater than 100%.

The use of goal-setting in both the comparison and treatment districts could introduce concern that observed effects in intermediary steps are due to goal-setting. However, since goal-setting is most effective when incentives are strong (Corgnet, Gómez-Miñambres, & Hernán-González, 2015), we are confident in attributing any observed effects observed to the PBI treatment.

**Table 4.3.** Facility and volunteer association indicators for a performance-based incentive intervention in rural Mozambique

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**Indicators for health facilities<sup>a</sup>**

Number of women attending first antenatal care visit  
 Number of HIV-infected women attending antenatal care  
 Number of women delivering at health facility  
 Number of HIV-infected women delivering at health facility  
 Number of HIV-exposed children attending child-at-risk postnatal visits

**Indicators for community volunteer associations**

Number of visits with pregnant, HIV-infected women  
 Number of visits with caretakers or HIV-exposed children <18 months

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<sup>a</sup> Goals for each facility-based indicator were set specific to the facility's mean monthly baseline for previous year

*Evaluation.* The five facility indicators were assessed quarterly in both the intervention and control districts, with the percent of goal achieved based on the monthly mean for that quarter. Data for facility services was initially anticipated to be at the facility worker and patient level. However, limited resources precluded this approach and service delivery was reported at the facility level, with n=6 health facilities.

The research team leads (RCS and OS) calculated percent of goal achieved for that quarter and then held a meeting with each facility to review quarterly performance and amount of incentives earned, discuss factors that affected the performance, and learn about facilities' priorities for spending incentives earned. PBIs were awarded to intervention facilities based on the percentage of the goal achieved. Percent achievement <0% earned 0% of available, >0% and <100% earned a proportional amount, and >100% earned a maximum of 100% of the available PBIs.

*Sample size calculations.* The sample size for facility service delivery was originally calculated to include maternal and child health nurses and midwives and community volunteers in hierarchical linear modeling. Given the number health workers who directly provided prevention of vertical transmission services (67 in the intervention and 42 in the control), we had a 96% power to detect a 15% increase considering a 10% loss to follow-up for health workers and a design effect size using an intra-class correlation of 0.05. As we were unable to collect worker-level service delivery data and used facility-level data, our impact analysis is greatly underpowered and the results are taken as indicative only.

Funds were to be disbursed to the district health authority using processes and agreements (e.g. Memorandums of Understanding) modified from CARE's existing PEPFAR support mechanisms. In order to receive the funds earned, each facility was to prepare a

solicitation of funds to the district and then the district administrator would generate a bank check. A justification of expenditures was required before the next quarterly transfer could occur.

*Use of funds.* A committee at each health facility exercised the autonomy to decide how to use the financial incentives earned by the facility each quarter, allowing each facility to respond to and plan for short-term and long-term needs. During intervention development, the research team presented options for proportion of incentives allocated to individual workers vs. the health facility (all to facility, all to individuals, half to each). All facility committees were interested in splitting the incentives nearly 50/50 between individual incentives and the facility.

The health facility committees felt that all facility staff from the lead physician to janitor contributed to creating a positive service delivery environment that would help retain HIV-infected women and their HIV-exposed children in the cascade of PVT services. Therefore, all facility workers were eligible to receive personal incentives once goal was achieved, even though the goals were specific to maternal and child health. This is in contrast with models where personal financial incentives are allocated based on role, years of experience, and other factors.

#### *Community volunteer PBI intervention*

Each community volunteer association was comprised of 20 volunteer members who were expected to conduct a total of 6 patient visits and 1 educational or outreach activity per month. These visits include both home care visits and visiting patients identified by health facilities as “lost to follow-up” to encourage them to return to clinical care. Associations were led by 3 officials who managed external relationships and monitored volunteer activities. The stipend for volunteer members was \$28/month and for leaders was on average \$51.80/month,

depending on responsibilities. For reference, activista member stipends are approximately 42% of the minimum monthly salary in Mozambique.

Similar to the facility-based PBI intervention, the two associations in the intervention district were engaged in goal-setting and were eligible to receive PBIs based on goal attainment. The one comparison association was engaged in goal-setting alone.

*Incentives.* The total budget for community associations was \$6,600, or \$3,300 per each of 2 associations. Thus, \$825/quarter for each of the evaluation periods was available across the two indicators per association (Table 4.2). This was approximately \$100 more than a full stipend per volunteer per quarter.

*Goal setting.* The two indicators for associations were number of home visits with HIV-infected pregnant women and number of home visits with caretakers of HIV-exposed children <18 months (Table 4.3). Similar to the facility indicators, these two indicators were chosen because they spanned the range of PVT service cascade and there is a significant drop-off of HIV-exposed children returning for follow-up visits and early testing for HIV. Important components of home visits were to encourage women and caretakers to follow-up with facility appointments and prophylaxis and treatment adherence.

Activistas strongly preferred association-level goals for the PBIs instead of individual goals. This was related to the group identity of the association and the concern that depending on neighborhood composition, some volunteers might have more or less eligible patients in their catchment area.

The association-level goal for each indicator was set at 25 visits, with a minimum 5 new patients each month and the rest follow-up visits. Associations' baseline activities for the year prior to the intervention had been reviewed and great variation was found from months to month



for these two indicators. Together with a change in associations' reporting procedures during the baseline year, there was concern regarding quality of the data to use as a baseline. Thus, the goal for each indicator considered the expectation that volunteers visit 6 patients/month and not to take away from non-PVT activities, so that each volunteer would have at least one PBI-related visit per each indicator and some would make two.

*Evaluation.* Each quarter, the research team calculated the percent of goals achieved for each of the indicators and met with the association to review quarterly performance, discuss factors that affected the performance, and initiate a conversation about priorities for incentives earned. Percent of goal achieved was calculated as  $\text{number of visits} / 25 \text{ visits} * 100$ , so that goal achievement was  $>0\%$ , with possibility of  $>100\%$  but no negative percentages.

*Disbursement of funds.* Similar to the facilities, funds were to be disbursed to each association using processes and agreements (e.g. Memorandums of Understanding) modified from CARE's existing PEPFAR support mechanisms once performance was confirmed. A justification of expenditures was required before the next quarterly transfer could occur. Associations opened a separate checking account for managing the PBIs, which was important for transparency. All three association leaders had signing power for the PBI bank account.

*Use of funds.* Similar to health centers, association members were interested in personal financial incentives and reinvestment in the association. While each association had the autonomy to decide how to spend funds, the proportion of financial incentives directed towards the individual vs. association was kept the same (50/50) between the two intervention associations. During the intervention design, volunteers were interested in non-financial incentives, including recognition of high-performing volunteers with an accompanying material gift. Any resources for non-financial incentives came from the total incentive amount. High-

performing volunteers were identified by total number all home visits (not specifically the two indicators) to avoid detracting effort from non-incentivized indicators.

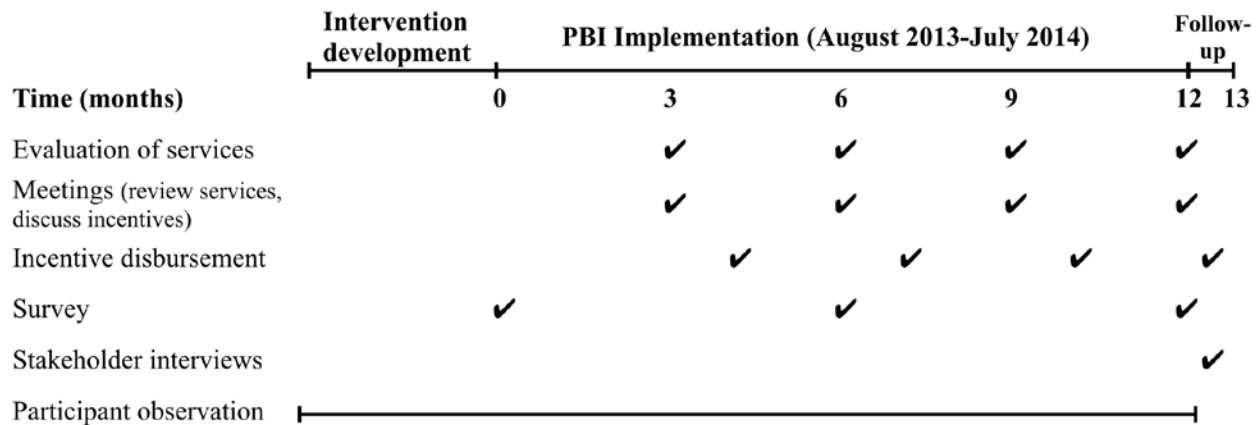
## **Data collection**

### *Service delivery data*

The research team sought to streamline data collection by using the existing data collection processes; the Center for Health Collaboration (the PEPFAR-implementing partner) independently checks original paper records against monthly reports submitted by health facilities (Fig. 4.2). Service delivery data abstracted from reports electronic (facility) and paper (volunteer associations) reports, entered into Excel 2011 (Microsoft, Seattle, WA), and imported into Stata v14 (StataCorp LP, College Station, TX) for analyses.

*Service delivery data collection for health facilities.* The research team sought to streamline data collection by using the existing data collection processes; the Center for Health Collaboration (the PEPFAR-implementing partner) independently checks original paper records against monthly reports submitted by health facility (Fig. 4.2).

*Service delivery data collection for volunteer associations.* Since these two indicators were not already recorded in standard association reporting procedures, each volunteer filled out an additional sheet for these two indicators (Appendix C). The association Field Manager compiled these indicators on a monthly basis when he reviewed member activity registries. The Field Manager then shared a one-page report documenting visits conducted by each volunteer on a monthly basis with the research team.



**Fig. 4.2.** Data collection timeline throughout the PBI intervention design and 12-month PBI implementation with facility- and community-based health workers in rural Mozambique

#### *Motivation and workplace environment surveys for facility-based workers and community volunteers*

*Instrument.* Motivation and workplace characteristics were evaluated longitudinally using surveys at intervention baseline, midline, and endline. Constructs from our formative work were compared to two known tools to capture health worker motivation: a questionnaire for community health workers in Haiti (Mbuya, 2008; Menon et al., 2008) which has since been adapted for use in Zimbabwe (Kambarami et al., 2016) and a 23 item tool developed to measure motivation in hospital health workers in Kenya (Mbindyo, Blaauw, Gilson, & English, 2009). Mbuya et al.'s (2008) tool captured the vast majority of constructs from our formative work and was thus selected as the basis for our survey, with modifications.

Our survey included 87 questions across the constructs mapped in the conceptual framework (Appendix D). Questions were asked on a 1-5 Likert-type scale (Never, Rarely, Sometimes, Usually, Always; or Completely Disagree, Disagree, Neither agree nor disagree, Agree, Completely Agree) specific to question phrasing. In addition, questions on how goals (n=20) and incentives (n=11) affected workplace effort were asked at the endline survey only.

There were some constructs not anticipated to be in the pathway of PBIs to increased number of service delivery (and therefore not included in the conceptual framework) but were important in the context of health worker's ecological environment. These were measured to ensure PBIs did not create problems elsewhere (e.g. time spent, n=11; workload, n=5) or could be explained by other factors (e.g. training, n=3; prevention of vertical transmission knowledge, n=15). Knowledge questions were asked at baseline and endpoint only.

The survey was adapted to be specific to each health worker cadre (e.g. maternal and child health nurses, other clinicians, non-clinicians, volunteers), translated into Portuguese, and back-translated into English. Experts in the local language Xitswa were invited to help standardize the best oral translations from written Portuguese. Local research assistants fluent in Portuguese and Xitswa with experience as community HIV counselors or prior survey experience were trained to conduct the surveys. The surveys were piloted with each cadre of health worker in a similar, neighboring district not involved in the intervention and then further revised.

*Survey data collection.* All workers at the small peripheral facilities and all maternal and child health nurses and midwives and representatives of other sectors at the district and large peripheral facilities, representing 63% of workers at those facilities, were invited to participate in the survey. Only five facility workers declined to participate, due to time constraints. All volunteer association members and leaders were invited to participate, with a 93% participation rate.

The majority of facility workers filled out the surveys independently and then reviewed their completed survey with a member of the research team for quality control. All volunteers

and some facility-based workers completed the survey orally with a member of the research team.

### *Qualitative data collection*

*Participant observation.* Ethnographic observation occurred at longitudinal planning meetings, quarterly performance review meetings, regular phone contact, and unstructured observation at health facilities or association meetings. These were recorded in detailed handwritten notes in Portuguese and English. Handwritten notes were typed and compiled into an electronic notebook on a daily basis.

*Endline interviews.* Key stakeholders from both districts (e.g. district health administrators, facility leaders and workers, volunteer leaders and members) were invited to participate in semi-structured interviews at the end of the one-year PBI intervention. Interview questions asked participants about their perceptions of the intervention in discrete steps, beginning at intervention development through incentive disbursement. Questions probed facilitators, challenges, and suggested improvements for the PBI intervention design and implementation (Appendix E). Interviews were conducted in Portuguese or Xitswa per participant preference and took 55-75 minutes to complete.

### **Data analysis**

*Mixed effects models for service delivery and constructs.*

The non-parametric Wilcoxon-Mann-Whitney test for ordinal data was used to assess differences in goal attainment status (yes, partial, no) for total proportion of goals achieved between intervention and comparison districts. The Wilcoxon-Mann-Whitney test was also used

for each indicator and questions asked at endline survey only. Linear mixed effects models were used to analyze the impact of PBIs on percent change in number of services delivered (objective 1), motivation and workplace environment constructs (objective 2), and job satisfaction and intention to leave (objective 3). Treatment (PBI), time, and the treatment\*time interaction were modeled as fixed effects, with health facility modeled as a random effect for impact on service delivery and workplace constructs and intention to leave for facility workers.

Similar to the facility-based health workers, rigorous adherence to analysis standards necessitates analysis at the association level since treatment was at the district level. However, the limited number of community volunteer associations (n=3) precludes a rigorous statistical comparison at the association level in this manner. With this in mind, we present the less-rigorous mixed effects models at the level of the individual, modeling treatment (PBI), time, and the treatment\*time interaction as fixed effects with association and individual as random effects.

#### *Reducing variables into motivation and workplace environment factors*

We used confirmatory factor analysis with an oblique (promax) rotation for correlated factors to reduce survey questions into salient constructs, with a variable loading  $>0.4$ . We made exceptions for variables loading  $>0.3$  if the variable was conceptually strongly related to the construct. Then we confirmed that the Chronbach's  $\alpha$  representing internal consistency explained was  $>0.7$  for each factor. We made exceptions for factors with a Chronbach's  $\alpha >0.5$  for factors that strongly aligned with findings from our formative work.

We assessed Chronbach's  $\alpha$  using all participant observations for that construct at all timepoints, and then broke responses down by treatment status and timepoints to see that

constructs held together. The Chronbach's  $\alpha$  reported here for facility-based workers and volunteers include all data timepoints.

### *Qualitative data analysis*

Audio recordings of meetings were used to augment handwritten notes when the notes were typed. Audio recordings of the exit interviews were transcribed in Portuguese and translated into English. Two members of the research team independently coded the exit interviews according to the principles of frequency, universality, differentiation, and emphasis (Baxter & Eyles, 1997).

### **Informed consent**

Ethical approval was granted by the Cornell University Institutional Review Board for Human Participants (Protocol ID# 1205003043), and letters of support were obtained from the district and provincial health authorities in Mozambique. Informed written or oral consent was obtained from each participant depending on literacy for surveys at each timepoint and written consent was obtained for all exit interviews. Group oral consent was obtained at the beginning of meetings.

## **RESULTS**

### **Participants**

Data were available on a maximum of 191 unique workers through participant observation, longitudinal surveys (n=153), and endline interviews (n=17) (Table 4.4). Briefly,

facility-based health workers were predominantly female (63%) with a mean age of thirty years (Table 4.5). The only significant demographic differences between intervention groups were that clinicians in the intervention district had a median of 9.5 more months of work experience and spoke one language less on average than those in the comparison district. Of the volunteers who participated in the surveys (n=70), 77% were female with an average age of 39.3 years. Intervention volunteers were older, had more children, lower levels of education, and one more month of work experience than comparison volunteers.

**Table 4.4.** Health workers who participated in the performance-based incentive intervention, by type of data collected<sup>a</sup>, cadre, and intervention status

Health worker cadre	Intervention District			Comparison District		
	Participant observation	Surveys	Exit interviews	Participant observation	Surveys	Exit interviews
Health systems administrators	2	-	2	2	-	-
MCH health center staff	18	18	2	10	10	3
Other clinical facility staff (e.g. physician, <i>técnico</i> , pharmacist)	50	23	4	18	17	-
Non-clinical facility staff (e.g. receptionist, cleaner, data analyst)	12	8	-	8	7	-
Community volunteers <sup>b</sup>	46	45	5	25	25	1
<b>TOTAL</b>	<b>128</b>	<b>94</b>	<b>13</b>	<b>63</b>	<b>59</b>	<b>4</b>

<sup>a</sup> Participants in participant observation represent maximum number of health workers. Of these, some participated in the surveys and some who were key stakeholders participated in the exit interviews

<sup>b</sup> Volunteer associations are generally comprised of 20 members and 3 leaders. The association in the comparison district lost members by intervention midpoint and gained new ones at intervention endline



**Table 4.5.** Demographics for all Mozambican health facility staff and community volunteers who participated in surveys on workplace characteristics, by performance-based incentive intervention status

Demographic characteristics	Facility-based staff			Community volunteers		
	Intervention (n=47)	Comparison (n=34)	Signifi- cance <sup>a</sup>	Intervention (n=44)	Comparison (n=24)	Signifi- cance <sup>a</sup>
Female	64%	62%		82	67	
Age (mean $\pm$ SD)	30 $\pm$ 9.5	29.0 $\pm$ 7.4		42.7 $\pm$ 11.7	33.3 $\pm$ 10.2	**
Single	87%	79%		43%	68%	
Lives with partner	36%	37%		67%	57%	
Has children	68%	58%		95%	88%	
No. of children (mean $\pm$ SD)	1.6 $\pm$ 2.4	1.2 $\pm$ 1.4		4.3 $\pm$ 2.3	3.0 $\pm$ 2.3	*
Total no. in household (mean $\pm$ SD)	4.7 $\pm$ 4.7	4.7 $\pm$ 3.1		6.6 $\pm$ 2.8	6.1 $\pm$ 2.4	
No. adults in household (mean $\pm$ SD)	3.2 $\pm$ 2.4	3.2 $\pm$ 2.5		3.3 $\pm$ 2.0	3.8 $\pm$ 2.1	
No. children in household (mean $\pm$ SD)	1.8 $\pm$ 2.5	1.6 $\pm$ 1.5		3.2 $\pm$ 2.1	2.7 $\pm$ 1.8	
Local origin (same or neighboring districts)	31%	25%		73%	63%	
Years lived in community currently serving (mean $\pm$ SD)	5.1 $\pm$ 7.0	7.4 $\pm$ 10.8		24.3 $\pm$ 16.6	16.9 $\pm$ 13.9	
No. languages spoken (mean $\pm$ SD)	2.9 $\pm$ 1.0	3.8 $\pm$ 1.1	***	2.4 $\pm$ 1.3	2.7 $\pm$ 0.9	
Christian	94%	94%		100%	92%	
Clinical facility staff	72%	74%		-	-	
Workers providing PVT <sup>b</sup> services	36%	29%		91%	96%	
Education						*
Primary school (1-5 yr)	3%	4%		46%	35%	
Secondary school (6-10 yr)	47%	29%		54%	39%	
University prep (11-12 yr)	50%	68%		0%	26%	
Mo. training (mean $\pm$ SD)	25.1 $\pm$ 23.4	24.6 $\pm$ 14.1		0.6 $\pm$ 1.3	0.5 $\pm$ 0.1	
Mo. training (clinician only)	29.8 $\pm$ 23.3	27.8 $\pm$ 11.6		-	-	
Mo. work experience (mean $\pm$ SD)	74.3 $\pm$ 100.1	49.2 $\pm$ 79.3		12.2 $\pm$ 9.6	10.9 $\pm$ 10.3	*
Median (range) months work experience (clinician)	27.5 (2, 420)	18 (0.25, 252)	**	-	-	-

<sup>a</sup> Significance refers to statistical differences between intervention and comparison groups within the same cadre

<sup>b</sup> PVT - prevention of vertical transmission of HIV

\* $p < 0.05$  \*\* $p < 0.01$  \*\*\* $p < 0.001$

## Impact of PBIs on facility delivery of prevention of vertical transmission of HIV services

### *Proportion of goals achieved and amount of incentives earned.*

The intervention district achieved 37% and the comparison district 43% of their total of 60 goal opportunities (Table 4.6). Based on their fully achieved goals and the proportion of the 12 goals partially achieved, the intervention district earned 45.1% (US\$8,111) of total funds possible (Table 4.7). There was no difference in goal attainment status (yes, partial, no) for total proportion and per indicator by intervention status, analyzed by the non-parametric Wilcoxon-Mann-Whitney for ordinal data. The district health authority was awarded a corresponding 41.5% of their maximum of \$900 incentives for a total of \$373.5 over the 12-month implementation.

**Table 4.6.** Proportion of goals achieved (n=60)<sup>a</sup> among health facilities participating in a performance-based incentive intervention in Mozambique

Reached goal <sup>b</sup>	Intervention District				Comparison District			
	District facility	Large peripheral	Small peripheral	Total	District facility	Medium peripheral	Small peripheral	Total
Yes	40%	35%	35%	37%	50%	40%	40%	43%
Partially	25%	25%	10%	20%	35%	15%	0%	17%
No	35%	40%	55%	43%	15%	40%	60%	40%

<sup>a</sup>5 goals/facility x 4 quarters = 20 opportunities to achieve goals per each health facility, and 60 opportunities to achieve goals per district across the three health facilities

<sup>b</sup>Goal is 10% increase above baseline

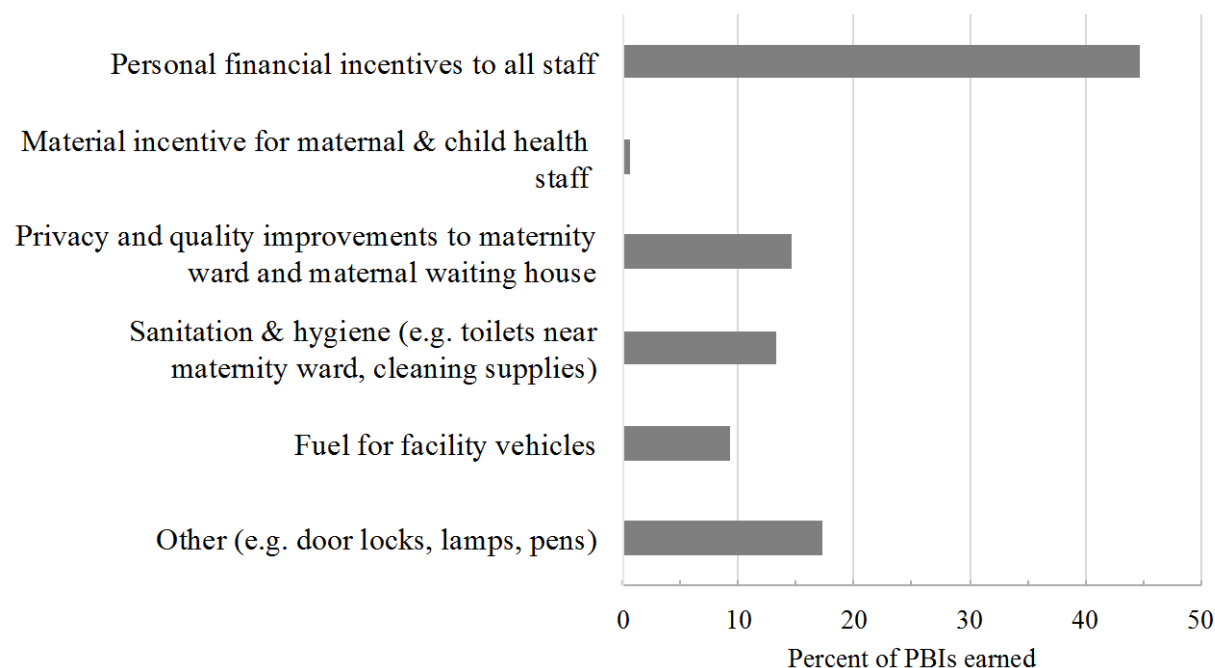
**Table 4.7.** Mean percent of goals reached and value of corresponding funds dispersed in the intervention district per quarter

Quarter	Mean % goal achieved <sup>a</sup>	Value
1	32.2%	\$1,447.20
2	47.9%	\$2,153.70
3	56.3%	\$2,533.50
4	43.9%	\$1,976.40
<b>Total</b>	<b>45.1%</b>	<b>\$8,110.80</b>

<sup>a</sup>% goal achieved = % available funds disbursed

### *Use of funds*

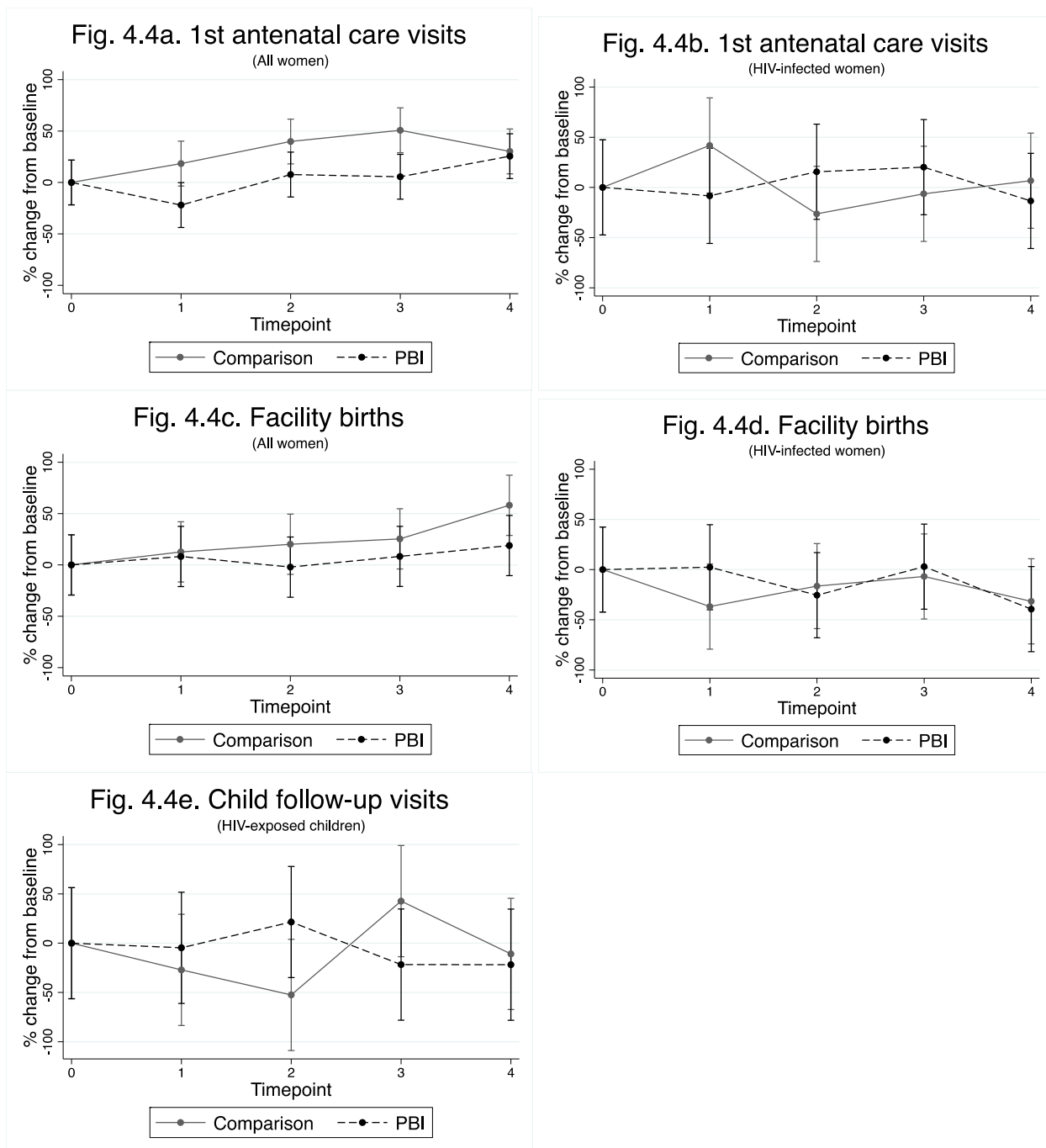
Approximately half (45%) of PBIs earned were spent on personal incentives to health workers across the three facilities (Fig. 4.2). The district and large peripheral facilities both opted to invest their full incentives into infrastructure for the first quarter and only began allotting personal financial incentives starting with the second quarter. One facility also recognized the maternal and child health staff with a one-time gift of traditional cloth (1% of district PBIs). Of the rest of the PBI funds, 15% focused on incentivizing women to come to the health facility, through improvements to the maternity ward (e.g. installing curtains for privacy and lamps, distributing bar soap to recently-delivered women), the house where pregnant women stay in anticipation of labor (e.g. installing electricity, a lock), and snacks for peer support groups for HIV-infected mothers. Another 13% was spent on sanitation and hygiene measures, including installing latrines right in the maternity ward and materials (e.g. buckets, laundry soap, etc.). The majority of the 9% spent on fuel and transportation by the district and large peripheral facilities (the small peripheral facility does not have a vehicle) went towards mobile clinics in the community, which included a focus on HIV testing and antenatal care, in addition to standard well-child consults. The district health authority spent its incentives on iron frames for the windows to increase the security of their building.



**Fig. 4.3.** How performance-based incentive funds earned by intervention facilities (n=3) were allocated

#### *Analysis of facility performance on PBI goals*

We found a significantly greater percent change in the number of facility births from baseline in the control group compared to the intervention between the first and final evaluation quarters (Fig. 4.4c). There were no other significant differences at endline, and differences at intermediate quarterly evaluations appear to reflect natural variation among health facilities (Table 4.8, Figs. 4.4a-b,d-e).



**Figs. 4.4a-e.** Impact of performance-based incentives on the percent change from baseline for the five incentivized prevention of vertical transmission of HIV service delivery indicators

**Table 4.8.** Difference by performance-based incentive intervention status at midline and endline compared to baseline for the five prevention of vertical transmission of HIV services in rural Mozambique (n=6 facilities)

PBI vs. comparison	Service delivery indicators				
	1st ANC (all)	1st ANC consult (HIV-infected)	Facility births (all)	Facility births (HIV-exposed)	HIV-exposed child visit
Time 2 v. 1					
Estimate	8.24	92.11	-17.78	-48.27	51.49
Std. error	16.44	34.53	16.58	43.10	39.37
p-value	0.62	0.01	0.28	0.26	0.19
Time 3 v. 1					
Estimate	-4.84	76.71	-12.65	-29.40	-86.73
Std. error	16.44	34.53	16.58	43.10	39.37
p-value	0.77	0.03	0.45	0.50	0.03
Time 4 v. 1					
Estimate	35.75	30.01	-34.75	-47.00	-33.38
Std. error	16.44	34.53	16.58	43.10	39.37
p-value	0.03	0.39	0.04	0.28	0.40

## Impact of PBIs on motivation and work environment of facility-based health workers

### *Overview of motivation and workplace constructs*

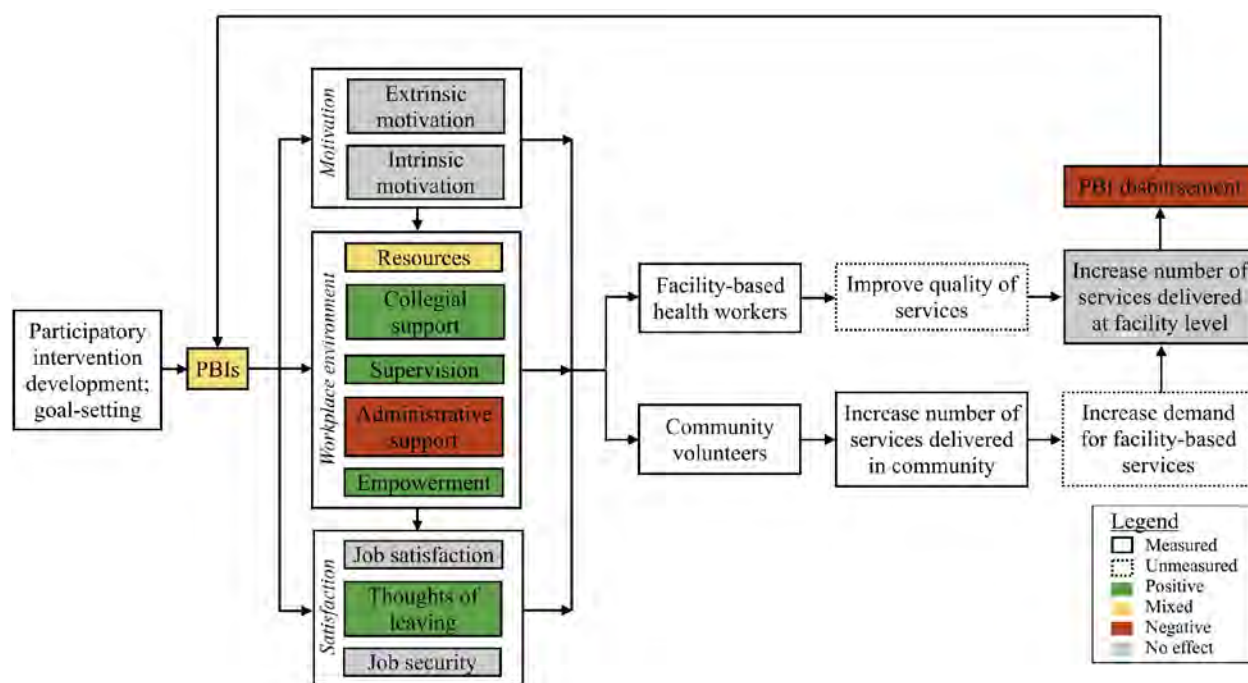
Twelve constructs emerged from the factor analysis of the longitudinal surveys that had high internal consistency and were important to the conceptual framework (Table 4.9). These constructs, single items from the survey (e.g. thoughts of leaving, job satisfaction, knowledge), and constructs only assessed through qualitative data (e.g. administrative support, process of PBI disbursement) are reported below in sections that map onto the conceptual framework specifically for facility-based health workers (Fig. 4.5).

**Table 4.9.** Workplace constructs for facility-based health workers confirmed by factor analysis, by internal consistency (Chronbach's  $\alpha$ ) for all workers and by performance-based incentive (PBI) intervention status

General Construct	Summary description	Number of variables	All workers	Chronbach's $\alpha$	
				Intervention workers	Comparison workers
Constructs in PBI pathway, measured at baseline, midline, endline					
Satisfaction with compensation	Satisfied with compensation relative to comparable jobs, responsibilities, colleagues	3	0.84	0.94	0.71
Motivating supervision	Supervisor inspired by example and interactions with worker, valued worker opinions	5	0.77	0.74	0.76
Structured supervision	Supervisor provided structure, feedback on records, updates	4	0.66	0.65	0.70
Lack of resources affects work	Lack of medications (ARVs, ART, other), PCR tests, supplies for reporting, transportation	7	0.73	0.80	0.72
Collegial support	Trusts colleagues, feels supported, can receive help with patients if necessary	4	0.54	0.46	0.63
Constructs in PBI pathway, measured at endline only					
Structured goals and recognition	Team is capable and receives recognition, deadlines and pressure help to achieve goals	6	0.81	0.76	0.87
Reasonable goals focused workers	Workers participated in goal-setting, goals were reasonable and focused workers	4	0.63	0.6	0.67
Goals created paths to achievement	Colleagues and action plan helped reach reasonable challenging goals	3	0.55	0.68	0.5
Incentives <sup>b</sup>	Individual incentives and collegial support helped improve service delivery, make health workers feel recognized	3	-	0.79	-
Constructs monitoring potential negative effects at baseline, midline, endline					
Time spent <sup>a</sup>	Antenatal and HIV-exposed child consultations	4	0.79	0.79	0.79
Appropriate workload	Worker responsible for appropriate amount of work for quality performance and compared to colleagues; time demands and pressure are manageable	5	0.62	0.66	0.54

<sup>a</sup> These task-specific questions were only asked of maternal and child health nurses and midwives

<sup>b</sup> These questions were only asked of the intervention group



**Fig 4.5.** Conceptual framework color-coded to show impact of performance-based incentives on facility-based health workers' motivation, workplace environment, satisfaction, and delivery of services

#### *Engagement in the PBI intervention.*

Facility-based workers in the intervention district displayed a clearer understanding of their goals than the comparison workers, according to exit interviews. PBIs made goals more salient: intervention workers were more likely to report that goals made their work more enjoyable ( $p=0.05$ ), that collegial support increased to achieve the goals ( $p=0.02$ ), and they kept goals in focus while working ( $p=0.03$ ). There were no significant differences in the goal-related constructs identified in Table 4.9.

Staff turnover created a lack of continuity in leadership that impacted the facilities' abilities to implement the PBI. For example, the leader of the large peripheral facility who was very engaged in the PBI design and early implementation was transferred halfway through the intervention. Similarly, after the departure of the only nurse at the small peripheral facility, a rotation of nurses and midwives staffed that facility during the intervention.



### *Incentive effectiveness.*

At endline, 40% of facility-based workers surveyed felt that the incentive amount was appropriate, with 33% neutral. Intervention workers' mean response to the incentives construct, that incentives and collegial support help to improve service delivery, was different by health facility ( $p=0.03$ ). Workers at the small facility reported strong agreement ( $4.2 \pm 0.96$ ) on the 1-5 Likert-type scale while workers at the district and large peripheral facility slightly disagreed ( $2.9 \pm 1.2$ ).

This was most likely related to delays in the timing of the personal financial incentives reaching workers and differences in this process between the three facilities (explicated in section *Process of PBI disbursement*). PBIs earned from the first two quarters were only disbursed from the district to the peripheral centers early in the fourth quarterly evaluation period and the third quarter PBIs arrived late into the fourth quarter for all facilities. This further delayed the individual incentive payment to the health workers. At survey endline, facility-based workers at the small peripheral facility had recently received three quarter's personal incentives at one time, likely supporting their more positive response.

### *Extrinsic motivation*

*Satisfaction with compensation.* At baseline, all workers were slightly dissatisfied with their compensation and we were unable to detect a change as a function of the longitudinal surveys (Table 4.10, Fig. 4.6a).

*Social recognition.* At baseline, workers reported feeling high levels of respect from the community, other types of health professionals, and NGO partners, which did not change for the first two. Intervention facilities compared to comparison reported marginally significantly higher

feelings of being respected by NGO partners at midline ( $p=0.05$ ) and endline ( $p=0.08$ ) compared to baseline (Fig. 4.6b)

### *Intrinsic motivation*

Facility-based health workers were highly intrinsically motivated at baseline. The PBIs had no effect on intrinsic motivation, as measured by individual variables including the worker feeling he or she is contributing to improving conditions in the community (Fig. 4.6c), improving health behaviors in a positive direction, and enjoyment of work.

### *Resources*

At baseline, facility based workers reported resource shortages sometimes affected their ability to deliver care, and there was no significant change throughout the intervention (Fig. 4.6d). Qualitatively, health workers reported stock-outs of HIV rapid and CD4 tests, amoxicillin, paracetamol, and Nevirapine during the intervention, which occurred once province-wide and another time in the peripheral facilities. In the latter instance, lack of fuel and administrative were key contributing factors.

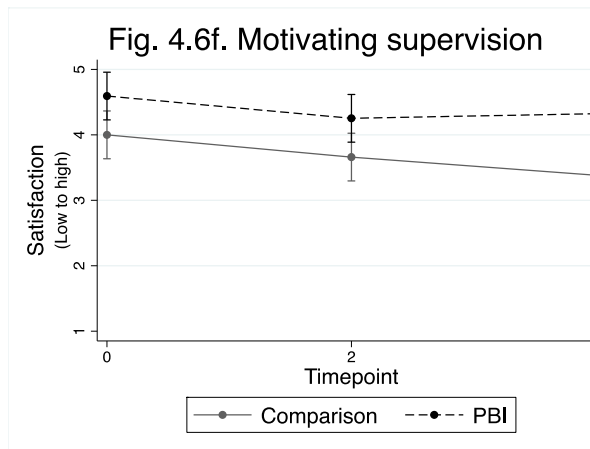
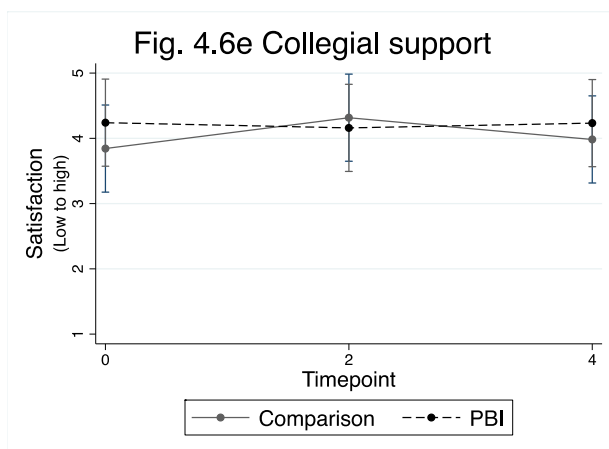
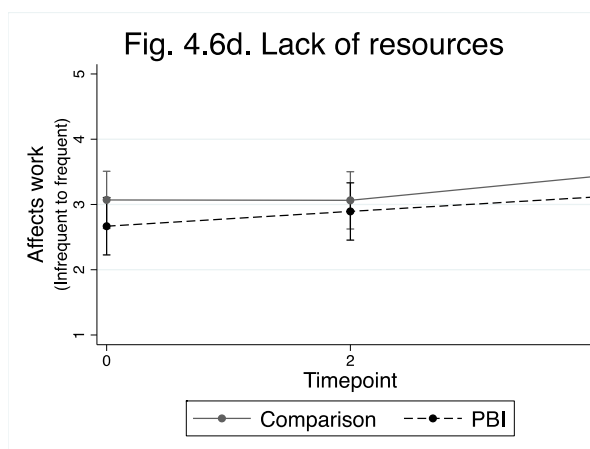
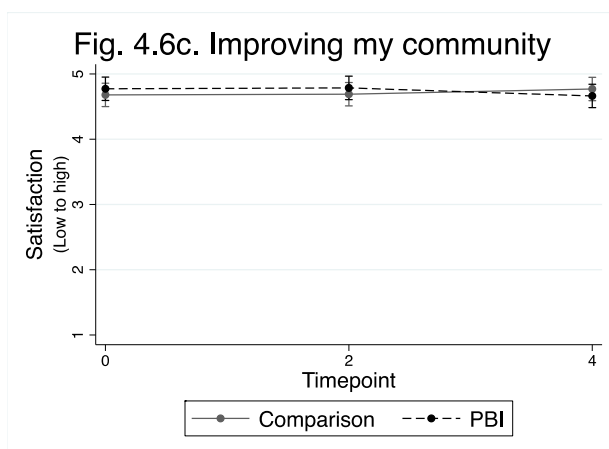
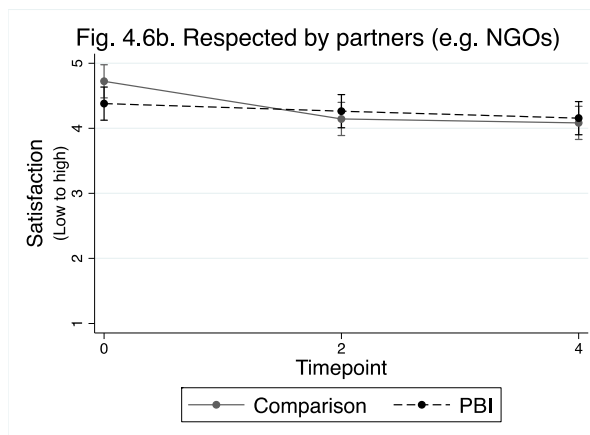
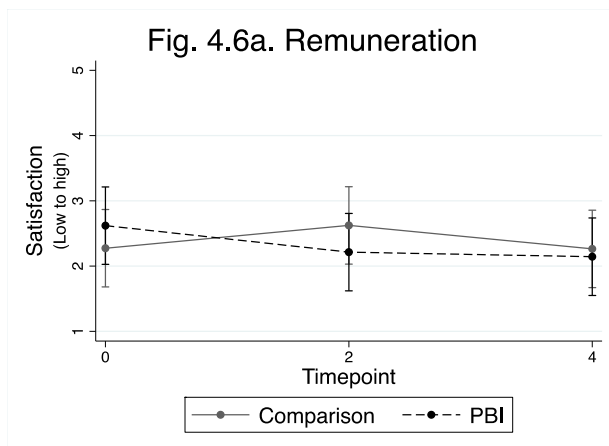
Resources strategically allocated from earned PBIs included privacy, hygiene, and comfort measures meant to incentivize women to come for care and increased outreach in the community through mobile clinics. However, these resources were delayed due to delays in PBI disbursement.

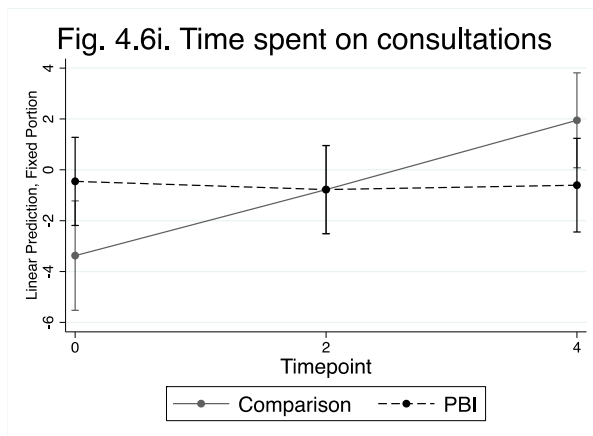
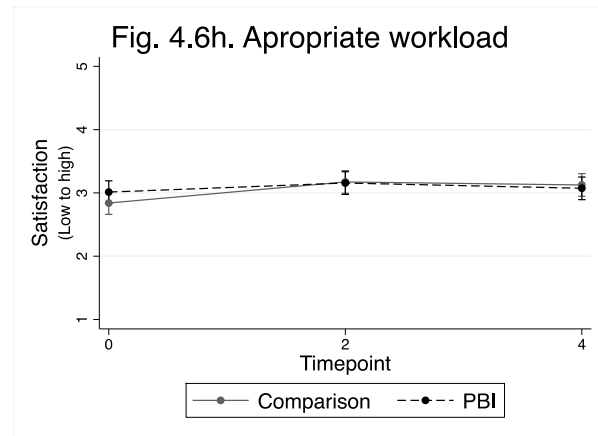
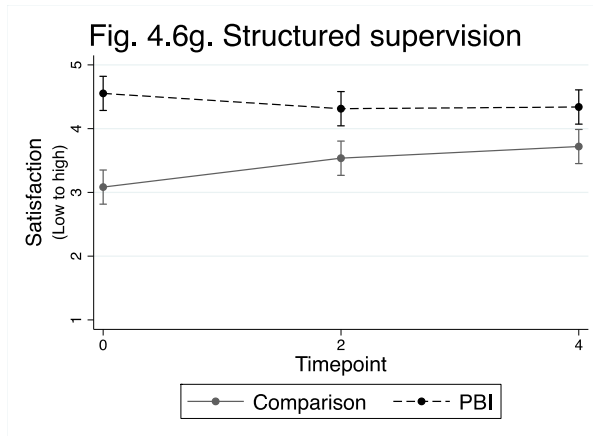
**Table 4.10.** Difference between PBI and comparison health facilities in workers' motivation and satisfaction with workplace environment constructs at midline and endline compared to baseline

PBI vs. comparison	Remuneration	Improving community	Enjoys work	Change behaviors	Community values work	Respected by partners (NGOs)	Respected by other health workers	Resources	Collegial support	Structured supervision	Motivating supervision
Time 2 v. 0											
Estimate	-0.757	0.003	-0.167	-0.393	-0.187	0.463	0.283	0.233	-0.553	-0.693	-1.590E-07
Std. error	0.506	0.166	0.309	0.183	0.284	0.240	0.323	0.405	0.216	0.233	0.280
<i>p</i> -value	0.235	0.984	0.590	0.032	0.511	0.054	0.382	0.565	0.010	0.030	1.000
Time 4 v. 0											
Estimate	-0.467	-0.200	-0.700	-0.037	0.210	0.417	-0.123	0.090	-0.147	-0.850	0.347
Std. error	0.506	0.166	0.309	0.183	0.284	0.240	0.324	0.405	0.216	0.233	0.280
<i>p</i> -value	0.356	0.227	0.024	0.840	0.459	0.083	0.703	0.824	0.497	0.000	0.217

**Table 4.10.** (continued)

PBI vs. comparison	Appropriate workload	Adequately prepared	Adequate training	Refresher training	Time spent
Time 2 v. 0					
Estimate	-0.190	0.573	-1.633	-0.283	-
Std. error	0.153	0.300	0.577	0.551	2.920
<i>p</i> -value	0.216	0.056	0.005	0.607	0.988
Time 4 v. 0					
Estimate	-0.227	0.427	-0.033	-0.453	-
Std. error	0.153	0.300	0.577	0.551	5.473
<i>p</i> -value	0.140	0.155	0.954	0.411	1.047
					0.000





**Figs. 4.6a-i.** Graphs of key motivation and workplace environment constructs as responses in mixed effects models, predicted by intervention, time, and intervention\*time interaction for health facilities engaged in a performance-based incentive intervention in Mozambique. Constructs are mapped on a 1-5 Likert-type scale, with the exception of time spent, which was an assigned score.

The strategic reinvestment of PBIs in the facilities were meant to incentivize women to come to the facility for care through privacy, hygiene, and comfort measures in the maternity ward and maternal waiting house and snacks at support groups for HIV-infected mothers. Increasing outreach in the community through mobile clinics including HIV testing, antenatal care, and facility referrals was another strategic use of incentives.

### *Collegial support*

Collegial support as a strategy for goal attainment was significantly higher at endline for the intervention group ( $p=0.03$ ) and was supported by qualitative data. For example, one intervention nurse reported that “*colleagues were really focused on maternal and child health*

[sector], so they all were worried and asking ... ‘how are we doing on our goals?’ ”[MCH nurse, exit interview #103]. Workers from other parts of the facility reported increasing referrals of pregnant women to the maternal and child health sector. One worker reported accompanying a woman in labor to the facility in order to support goal achievement. We did not find an effect of PBIs on the collegial support construct (which included variables for trusting colleagues and feeling supported) at endline compared to baseline, although collegial support increased among the comparison facilities at midline compared to baseline (Fig. 4.6e).

There was some concern about “free riders”, or those who benefited from incentives but did not significantly contribute effort. Nineteen percent of facility workers in the intervention district reported concern that group incentives would make some colleagues lazy, with 16% neutral. This manifested in debates for how incentives should be shared:

*“there were workers who received lots of complaints about their services, and when it was time to share the [incentives], some workers wanted to give less to those workers, arguing that they have a poor collaboration in the activities. They thought these workers shouldn’t receive the same amount, since some workers leave at 5 p.m. or 6 p.m. and others at 3 pm for instance....at the end, after an intense debate, most workers agreed that the amount should be the same for everybody...and if the workers would give stronger effort to their activities, there would be no problem”*

[Facility leader, Exit interview #111]

### *Supervision*

Structured and motivating supervision were higher in the intervention facilities at baseline. While there was no effect of PBIs on motivating supervision (Fig. 4.6f), satisfaction with structured supervision increased in the comparison group over the course of the intervention (Fig. 4.6g). At endline, workers at the intervention facilities reported stronger agreement with feeling proud when they received feedback regarding the PBI intervention goals ( $p=0.03$ ). Qualitatively, facility and maternal and child health sector leaders in the intervention district

were more engaged than in the comparison district and concerned about their facility's performance.

#### *Administrative support*

The intervention facilities received mixed support from their district administration. While the intervention district administration professed support and was engaged in developing the PBI intervention, health workers felt that there was a lack of leadership in addressing obstacles that had plagued the district before and during the PBI intervention. Examples of these obstacles included stock-outs of medications, HIV tests, and cooking supplies for the facilities and trading fuel allotments for political favors. Another example was a key administrator failing to complete tasks essential to the position, which challenged the functioning of health system and the PBI intervention.

#### *Empowerment*

The PBI intervention empowered facility workers through autonomy to prioritize facility-specific issues and to address implementation barriers. During an intervention planning meeting, one facility leader reported that this was the first time she had been involved in prioritizing facility needs (Intervention planning meeting #202). Another facility leader noted that the group goals led health workers to *“start to see by themselves what was working or not, and what they could do to improve it in order to receive their [incentive] amount. That was a way of giving...autonomy. And that's a good thing”* (Facility leader 1, Exit interview #111). An example of a direct action resulting from this empowerment was health workers' initiating a process that resulted in the removal of the ineffective administrator after that official's actions

affected the first quarter of PBI earnings and disbursement. Another example was in preparing to share progress with the provincial health authority, a facility leader was prepared to share PBI expenditures for initiatives that should have been covered by the district, until the district administrator promised to properly allocate these items for the next quarter (3<sup>rd</sup> Quarter leadership meeting).

#### *Process of PBI disbursement.*

Logistical and leadership challenges delayed PBI disbursement in the intervention district and was even more delayed for the peripheral facilities. PBIs earned from the first two quarters were only disbursed from the district to the peripheral centers early in the fourth quarterly evaluation period and the third quarter PBIs arrived late into the fourth quarter for all facilities. This further delayed the individual incentive payment to the health workers.

For the first quarter, there was a one-month delay in internal processing of incentives from CARE to the district health authority. Then, there was lack of a clear process for how funds were handled at the facilities, which could not open a bank account. The original district financial administrator facilitated the payment of the PBI funds to the committee for the first and half of the second quarter in cash form for the district facility only in early in the third quarter. For the peripheral facilities, first payment happened later, after one committee member was elected to open a personal bank account to store the PBI funds. This was less than ideal amid concerns of transparency. As one worker reported in her exit interview:

*“Since I had a management position, I didn’t want my coworkers to think that I might use the money for personal things. But, when we all finally sat together to decide who was going to have the responsibility, I was satisfied because we chose a trustworthy person” [Exit interview #111].*



However, the most significant problem was transitions in leadership. First, the financial signing power was not transferred over to the new financial administrator following the district administrator's departure halfway into the study. This took several months to sort out and delayed payments for the second and third quarters. Even after the issue of signing power had been sorted, disbursement to the peripheral areas was delayed amid administrator vacation. Finally, the departure of peripheral facility leaders meant a new facility lead had to engage in the process of working with the district to release the funds.

The small peripheral health facility faced additional challenge of remote location and no access to transportation for applying PBI funds to materials to reinvest in the facility. This facility was located a distance from roads and marketplaces that sold the goods, and so it was even longer after the replacement nurse received the funds before staff were able to convert their earned PBIs into facility goods.

#### *Additional factors*

We found no effects of PBIs on knowledge, training, and appropriate workload at intervention endline compared with baseline. While both groups reported high agreement in feeling prepared for their job at baseline and throughout the intervention, workers were slightly dissatisfied with frequency of refresher trainings at baseline and throughout the intervention. There was no effect of PBIs on the knowledge of maternal and child health nurses on questions regarding preventing of vertical transmission of HIV. Appropriateness of workload was neutral at baseline and remained steady throughout the intervention for facilities in both districts (Fig. 4.6h). Time spent by nurses on antenatal and post-natal consults increased in comparison facilities but remained steady in intervention facilities (Fig. 4.6i).

## Impact of PBIs on volunteer association delivery of services to prevent vertical transmission of HIV

### *Description of proportion of goals achieved and PBIs earned*

The two intervention associations achieved high percentages of the goals set (89% and 98%) and earned a total of \$6,151 (Table 4.11). Association B reached a significantly higher proportion of their quarterly goals for visits with HIV-exposed children ( $p=0.047$ ) but there was no difference between the associations in terms of visits with HIV-infected pregnant women.

**Table 4.11.** Community volunteer percent of goals achieved and corresponding funds earned by intervention association in the intervention district of the performance-based incentive intervention

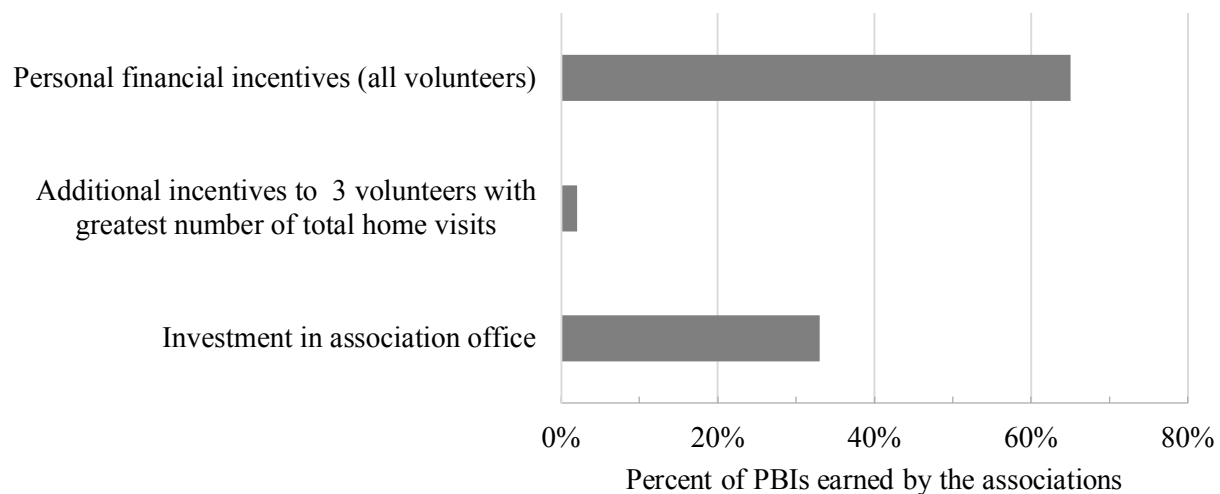
	Association A			Association B		
	Visits with HIV-infected pregnant women	Visits with HIV-exposed children <18 mo.	Average across indicators	Visits with HIV-infected pregnant women	Visits with HIV-exposed children <18 mo.	Average across indicators
Quarter 1	75%	100%	87%	100%	100%	100%
Quarter 2	100%	92%	96%	95%	100%	97%
Quarter 3	99%	68%	83%	96%	100%	98%
Quarter 4	100%	76%	88%	100%	100%	100%
Year	93%	84%*	89%	98%	98%*	98%
<b>Funds earned</b>			<b>\$2,927.10</b>			<b>\$3,224.10</b>

\* $p<0.05$

We were unable to evaluate the impact of incentives on association activities due to poor record quality in the comparison group. Beginning with the second month of the intervention, the comparison association meet irregularly, and while some effort was made to capture volunteer activities over the telephone by the association leader, it was of unreliable quality. The lack of meetings and decreased contact with other members and association leaders resulted in a number of volunteers ceasing their volunteer activities. The association revived late in the third quarter of the intervention, adding additional members to replace those who dropped out, but quality reporting procedures were still being developed.

### *Use of funds*

Of the total amounts earned, the associations spent 64% on individual personal incentives (Fig. 4.7). One-third of PBI funds was allocated to association sustainability, of which building a permanent office featured prominently. One association purchased the land and cement to make blocks and the other, which had already purchased land prior to the PBI, purchased cement only. Associations did not spend all of their 33% of funds earmarked for reinvestment in the association office by the end of the intervention as some of the planned investments were predicated on construction of the office.



**Fig. 4.7.** How performance-based incentive funds earned by intervention volunteer associations (n=2) were allocated

### **Impact of PBIs on factors intermediary to volunteer association PVT service delivery**

#### *Overview of motivation and workplace constructs*

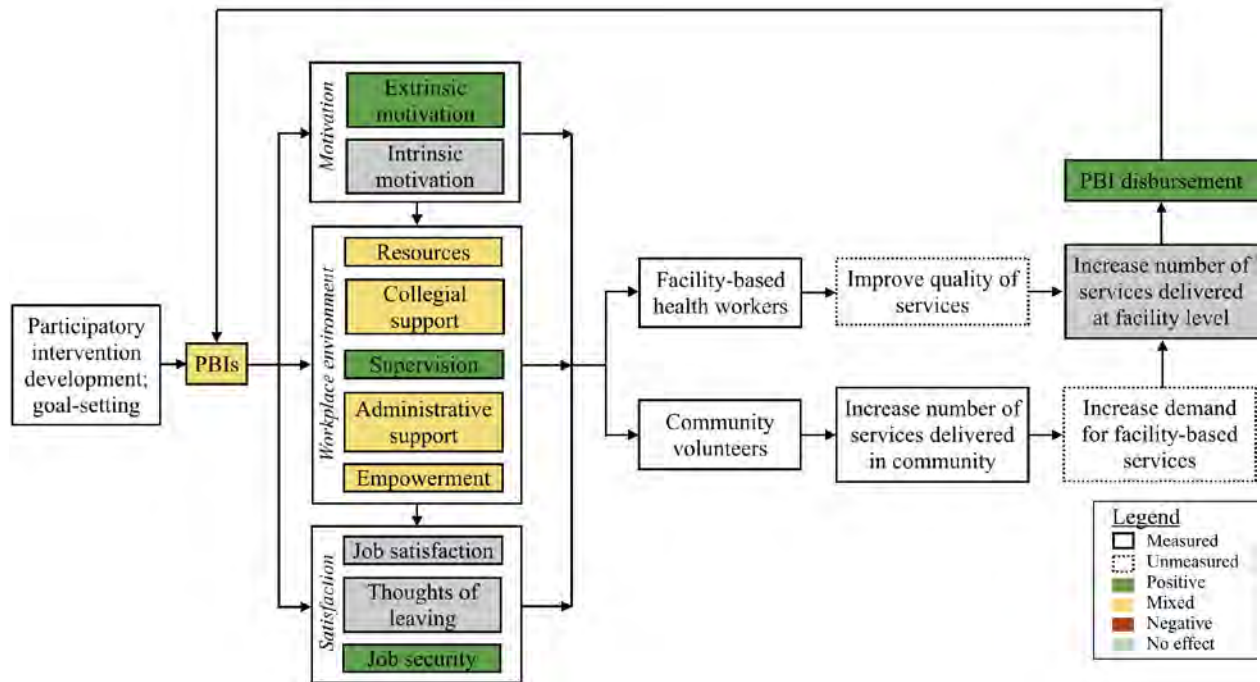
Six of the 9 constructs that were confirmed by factor analysis for community volunteers (Table 4.12) were analogous to those for facility-based workers: satisfaction with compensation, structured supervision, motivating supervision, appropriate workload, goals created paths to achievement, and incentives were similar to those for facility-based workers. Other constructs

emerged, including supervision facilitating learning and goals motivating emerged from the factor analysis. Quantitative and qualitative analysis of these constructs are presented below in sections that map onto the conceptual framework (Fig. 4.8).

**Table 4.12.** Workplace constructs for community volunteers confirmed by factor analysis, by internal consistency (Chronbach's  $\alpha$ ) for all workers and by performance-based incentive (PBI) intervention status

		Chronbach's $\alpha$			
General Construct	Summary description	Number of variables	All workers	Intervention workers	Comparison workers
Constructs in PBI pathway, measured at baseline, midline, endline					
Satisfaction with compensation	Satisfied with compensation relative to comparable jobs, responsibilities, colleagues	3	0.94	0.93	0.99
Structured supervision	Supervisor provided structure, feedback on records, updates	9	0.68	0.68	0.51
Motivating supervision	Supervisor inspired by example and interactions with worker, valued worker opinions	8	0.64	0.71	0.45
Supervision facilitates learning	Supervisor uses teaching moments, considers worker suggestions and concerns	8	0.59	0.6	0.49
Constructs in PBI pathway, measured at endline only					
Goals motivated	Made work more engaging and focused workers, supported pride	3	0.92	0.98	0.67
Goals created paths to achievement	Colleagues and action plan helped reach reasonable challenging goals	3	0.86	0.62	0.93
Incentives <sup>a</sup>	Individual and group incentives help improve service delivery, recognition	3	-	0.7	-
Constructs monitoring potential negative effects at baseline, midline, endline					
Appropriate workload	Worker responsible for appropriate amount of work for quality performance and compared to colleagues; time demands and pressure are manageable	5	0.52	0.54	0.31
Time spent					

<sup>a</sup> These questions were only asked of the intervention group



**Fig 4.8.** Conceptual framework color-coded to show impact of performance-based incentives on community volunteers' motivation, workplace environment, satisfaction, and delivery of services

### *Engagement in intervention*

PBIs were associated with increased engagement with the goals at intervention end. Of the two factors that emerged around goal-setting, volunteers who received PBIs reported significantly higher agreement with goals motivating ( $p=0.03$ ) and marginally significantly higher agreement with goals creating paths to achievement ( $p=0.06$ ). Qualitatively, volunteers in the intervention district had higher levels of engagement in the intervention, through observation at planning meetings and reported in exit interviews. One of the two intervention association had greater engagement in planning meetings through discussion and debate for the incentives and evaluation processes, which corresponded with a marginally significant increased satisfaction for each of the two goal constructs between groups. The comparison association had a turnover of volunteers in midway through the intervention, and the association seemed to be less engaged in activities.

### *Incentive effectiveness*

At intervention endline, 33% of community volunteers felt that the amount of the incentives was appropriate, with 23% neutral. There was a significant difference between the two volunteer associations, with the more engaged association less likely to agree that incentives were appropriate.

### *Extrinsic motivation*

Incentives to community volunteers were disbursed in a timelier manner than for the facility-based health workers, after a logistical challenge was resolved from the first quarterly disbursement (explicated in *PBI disbursement*).

*Satisfaction with compensation.* Volunteers were neutral in their satisfaction with their compensation, and there was no significant effect of PBIs on volunteers' level of satisfaction with compensation throughout the intervention (Table 4.13, Fig. 4.9a). However, qualitative data showed volunteers were highly dissatisfied by delays in their stipend, which was not captured in the compensation construct. With the Center for Health Collaboration transitioning to the PEPFAR-implementing partner, stipend payments (separate from the PBI intervention) to the associations had been delayed by 4 months, coinciding with the third quarter of the intervention.

*Recognition.* Volunteers reported feeling very respected and valued by their community and other health workers at baseline and throughout the intervention. However, there was a decrease in feeling respected by partners, (e.g. CARE and the Center for Health Collaboration) at the end of the intervention, which qualitatively agrees with the challenges that associations encountered with the transition between the NGOs as the supporting partner towards the intervention end, in terms of delays in stipend and feeling uncertain about their future (Fig. 4.9b)

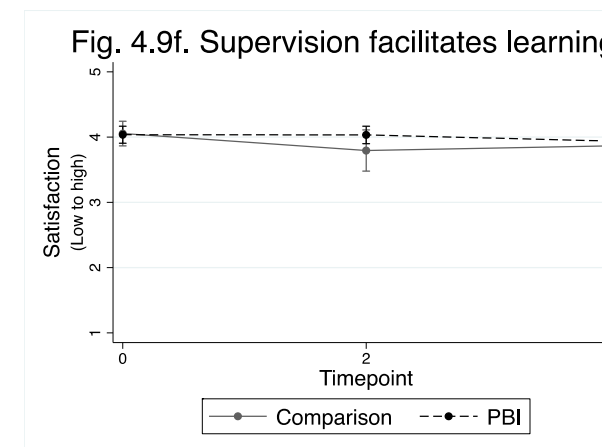
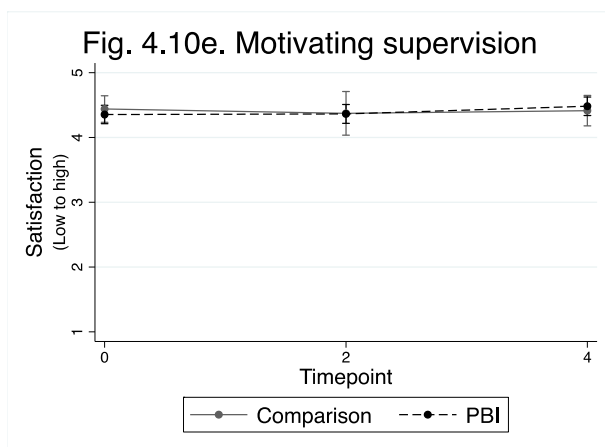
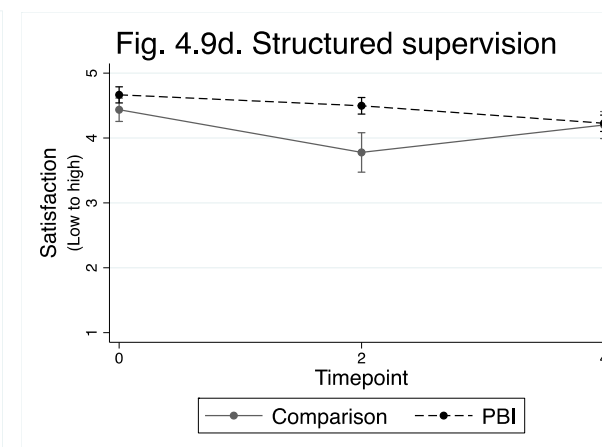
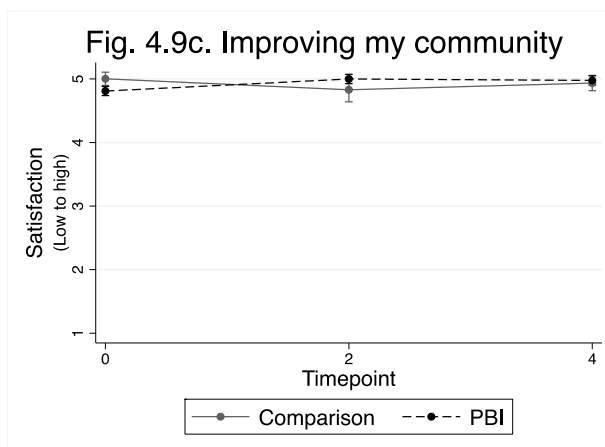
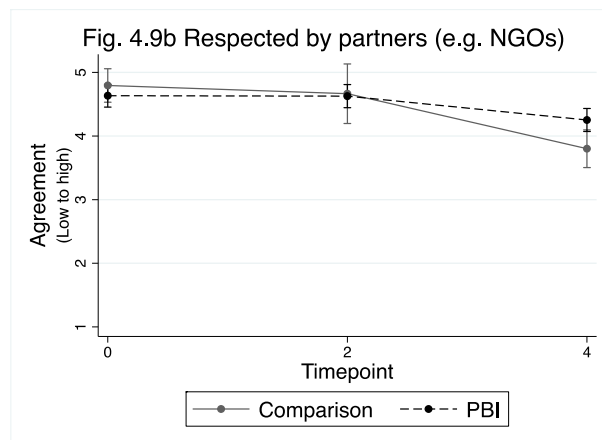
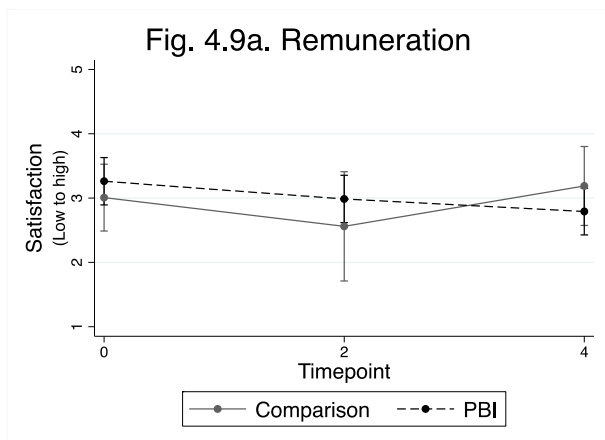
**Table 4.13.** Difference between intervention and comparison community volunteers in motivational and workplace environment constructs at the midline and endline compared to baseline of a performance-based incentive intervention in Mozambique

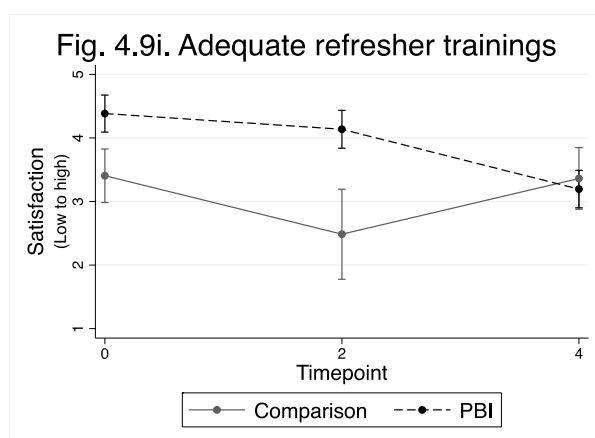
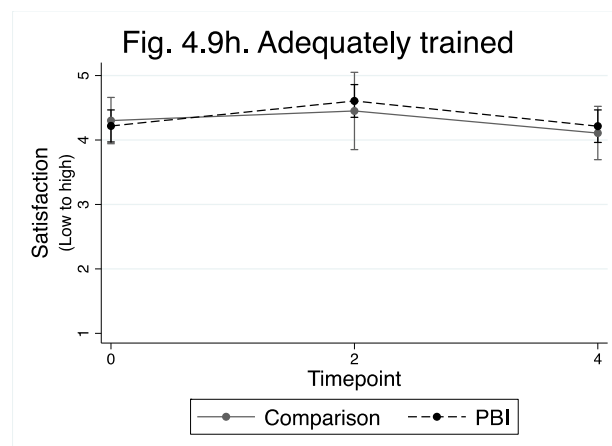
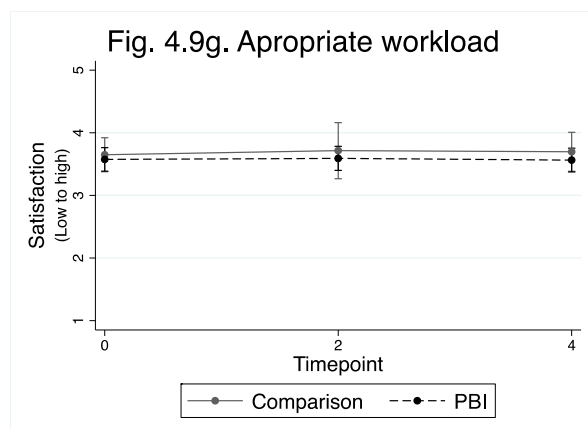
PBI vs. comparison	Satisfaction with compensation	Improving community	Enjoys work	Changes behaviors	Community values work	Respected by partners (e.g. NGOs)	Respected by other health workers	Structured supervision	Motivating supervision	Learning supervision
Time 2 v. 0										
Estimate	0.171	0.362	-0.062	-0.031	0.202	0.123	0.506	0.489	0.077	0.257
Std. error	0.524	0.119	0.162	0.150	0.193	0.299	0.39	0.202	0.209	0.2
<i>p</i> -value	0.74	0.002	0.70	0.84	0.30	0.68	0.19	0.02	0.72	0.20
Time 4 v. 0										
Estimate	-0.652	0.234	0.109	0.164	0.213	0.612	0.254	-0.202	0.153	0.093
Std. error	0.432	0.093	0.134	0.124	0.160	0.236	0.29	0.167	0.17	0.163
<i>p</i> -value	0.13	0.01	0.42	0.19	0.18	0.01	0.38	0.23	0.37	0.57

**Table 4.13. continued**

PBI vs. comparison	Appropriate workload	Adequately prepared	Adequate training	Refresher training
Time 2 v. 0				
Estimate	-0.05	0.027	0.239	0.673
Std. error	0.279	0.159	0.379	0.458
<i>p</i> -value	0.86	0.87	0.53	0.14
Time 4 v. 0				
Estimate	-0.059	-0.032	0.19	-1.146
Std. error	0.227	0.13	0.309	0.376
<i>p</i> -value	0.80	0.81	0.54	0.002







**Figs. 4.9a-i.** Graphs of key motivation and workplace environment constructs as responses in mixed effects models, predicted by intervention, time, and their interaction for community volunteers in a performance-based incentive intervention in Mozambique. Constructs were scored on a 1-5 Likert-type scale.

### *Intrinsic motivation*

Intrinsic motivation was high at baseline, as measured by questions about pride in role, enjoying work, supporting positive behavior changes in the community, and improving conditions in the community. There was a small but significant positive effect of intervention and intervention and interaction with time among PBI volunteers for improving conditions in community (Fig. 4.9c), but no effects of PBIs on the other questions.

### *Resources*

Resources are a very challenging issue with the volunteer associations. At baseline, volunteers in both districts reported that lack of transportation and resources for bicycle

maintenance usually or always affect their work, and there was no difference throughout the intervention. At baseline lack of stationary for reporting rarely affected volunteers work and significantly increased to “sometimes” for intervention volunteers over the course of the intervention. During our formative work, volunteers had decried the lack of a kit for home care items that would help with activities they engage in (e.g. supplies for helping to bathe patients, comb hair), however we learned that volunteers were not encouraged or trained to be doing these activities with patients, out of safety concerns.

### *Collegial support*

Although 87% of PBI volunteers reported that group incentives helped association members to support each other, 44% were concerned that group incentives would make some colleagues lazy because others would pick up the work. This tension was corroborated by endline interviews with association leaders and members, who reported incentives helped members to be more creative in reaching goals and also *“those who like to work do excellent, but those who don’t like to work, you are going to speak with him everyday...it’s like a child inside a house who does not like to work”* [Female volunteer, Intervention Association, Exit interview #106].

### *Supervision*

Volunteers reported very high satisfaction with structured and motivating supervision and satisfaction with supervision that facilitates learning at baseline (Figs. 4.9d-4.9f). While there was no effect on motivating or learning supervision, there was a significant positive effect of PBIs on structured supervision ( $p < 0.05$ ) compared to the comparison association at intervention

midline compared to baseline ( $p=0.02$ ). This corresponds with the period when the comparison association disbanded and its leader reported increased non-association time demands. The increased motivating supervision is corroborated with qualitative data, such as one volunteer reporting:

*“Our official always came and showed us what were the goals achieved for each and every one of us...how many people, how many caretakers of children, how many pregnant women...the volunteer, instead of wanting [to record] one wanted two. It was always like that, so we always had a vision.”*

[Female volunteer, Intervention Association, Exit interview #106].

#### *Administrative support*

The research team engaged the associations and the current PEPFAR-implementing partner in conversations around how to integrate the PBI intervention in the associations' sustainability, but a meeting with all three parties did not occur for scheduling conflicts. While there were no administrative barriers to the PBI intervention, the associations were challenged by transitions from CARE to the Center for Health Collaboration. One significant challenge occurred towards the end of the intervention, when there was a 4-month delay in stipends disbursement to the which translated into workers feeling discouraged, not having support for transportation, and subsequently feeling like they were losing the respect of community [Association Leadership meeting, #8-05].

#### *Empowerment*

Volunteers in the intervention district showed animation and pride when brainstorming for the future of the association. As an association leader reported, *“The [PBIs] came to help our association grow, we had nothing, we were at zero, and then the PBIs came...”* (Male leader,

Intervention Association, Exit interview #109). However, there was no difference in how the association approached non-contributing members.

#### *Process of PBI disbursement*

The initial significant barrier was having associations open a separate bank account to manage the PBI finances separate from the one shared by the PEPFAR-implementing partner. The bank accounts required a minimum amount to open the bank account, and the associations did not have cash funds to transfer for this purpose, resulting in a delay in first disbursement of incentives to the individual health worker.

#### *Additional factors*

*Appropriate workload.* At baseline, volunteers were generally satisfied with their workload, and there was no change over the course of the intervention (Fig. 9g). Qualitatively, there was more effort put into strategizing how to identify new patients, but there was not necessarily a change in workload. In addition, the association leaders did not find that reporting the association statistics was a burden, since it could be done by hand and did not require an accompanying written report.

*Training.* While there was no difference in feeling adequately trained to meet current responsibilities (Fig. 9h), the comparison volunteer association reported significantly greater satisfaction with frequency of refresher trainings at intervention endline compared to baseline (Fig. 9i). This coincides with more support for the Center for Health Collaboration to reinvigorate the association's reassembly after lack of leadership and loss of members.

*Knowledge.* Community volunteers in both districts reported high levels of correct knowledge around routes of vertical transmission, when HIV-exposed children should start being fed complementary foods, and timing for young child HIV testing. Knowledge around when HIV-infected women should stop all breastfeeding was low, particularly in the comparison group at baseline (5% correct), which increased to 47% at endline, showing a greater change over the course of the intervention than the intervention group, which stayed the same (39% correct).

## **Job satisfaction and intention to leave**

### *Facility-based health workers*

Job satisfaction was high at baseline and we did not detect a significant effect of PBIs over the course of the intervention (Table 4.14, Fig. 4.10a). Feeling secure in job was marginally significant ( $p=0.8$ ) among intervention versus comparison facilities at endline compared to baseline (Fig. 4.10b). There was a difference in frequency of thoughts of leaving in intervention compared to comparison facilities at midline ( $p=0.03$ ) and endline ( $p=0.06$ ) (Fig. 4.10c) but no difference in intention to leave (Fig. 4.10d).

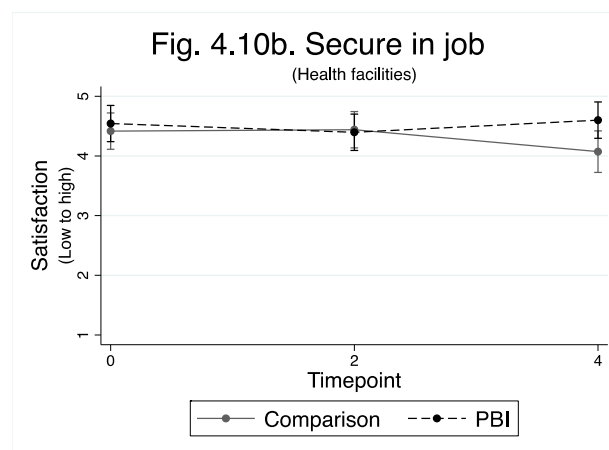
### *Community volunteers*

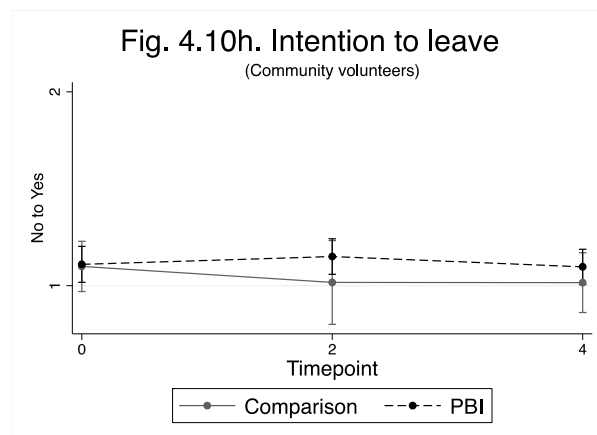
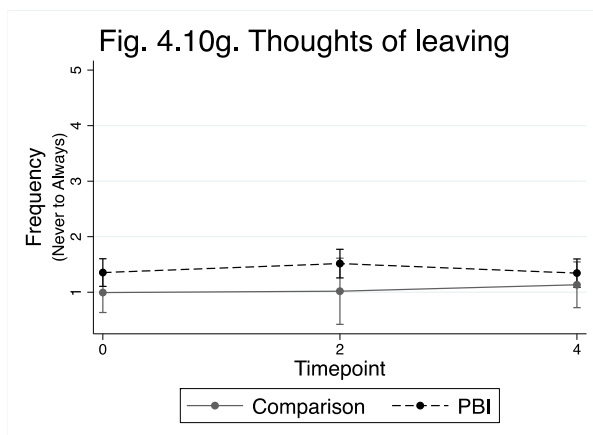
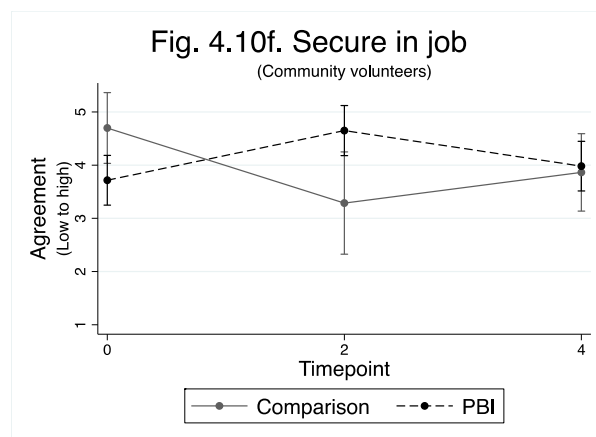
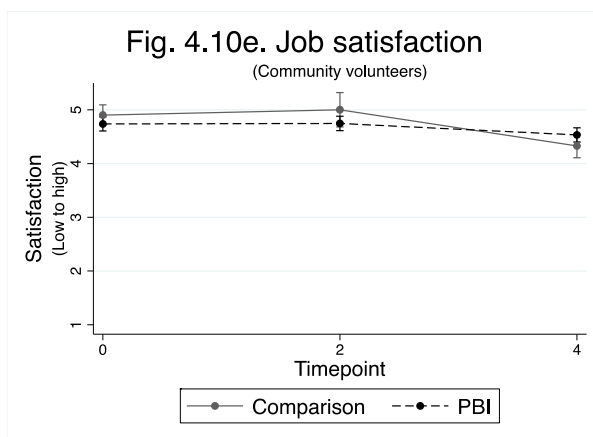
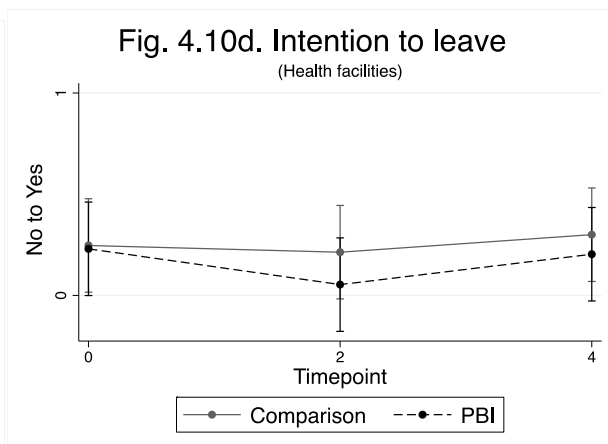
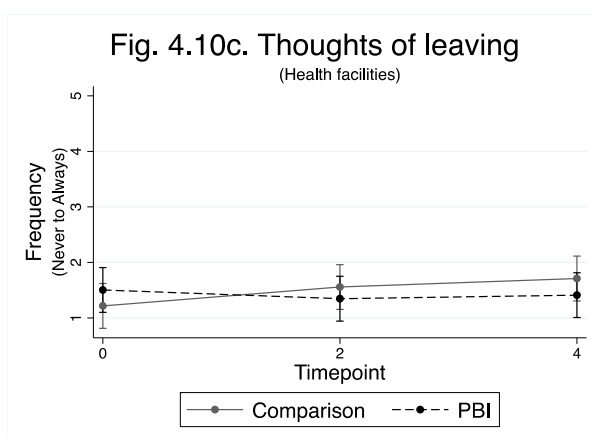
Job satisfaction significantly decreased among comparison volunteers compared to intervention volunteers at intervention endline compared to baseline ( $p=0.03$ ) (Table 4.14, Fig 4.10e). Perceived job security was significantly greater among intervention volunteers compared to comparison at both midline ( $p<0.000$ ) and endline compared to baseline ( $p=0.02$ ) (Fig. 4.10f). This corresponds to the timing of the comparison association's decrease in leadership and activities at intervention midline and may have lingered into the intervention endpoint. There

was no difference in frequency of thoughts of leaving (Fig. 4.10g) or intention to leave (Fig. 4.10h).

**Table 4.14.** Difference between intervention and comparison health facilities and community volunteers in job satisfaction, feeling of job security, and thoughts and intention to leave at midline and endline compared to baseline in a performance-based incentive intervention

PBI vs. comparison	Health facilities				Community volunteers			
	Job satisfaction	Secure in job	Thoughts of leaving	Intention to leave	Job satisfaction	Secure in job	Thoughts of leaving	Intention to leave
Time 2 v. 0								
Estimate	-0.390	-0.170	-0.497	-0.143	-0.09	2.345	0.138	0.123
Std. error	0.327	0.210	0.262	0.190	0.208	0.57	0.372	0.137
<i>p</i> -value	0.23	0.42	0.06	0.45	0.67	0.000	0.71	0.37
Time 4 v. 0								
Estimate	-0.027	0.401	-0.587	-0.080	0.371	1.099	-0.149	0.071
Std. error	0.327	0.227	0.261	0.190	0.171	0.471	0.304	0.113
<i>p</i> -value	0.94	0.08	0.03	0.67	0.03	0.02	0.62	0.53





**Figs. 4.10a-h.** Job satisfaction, perceived job security, and thoughts and intentions for health facilities and community volunteers engaged in a performance-based incentive intervention in Mozambique



## DISCUSSION

Overall, this study evaluated the impacts of PBIs on (1) the quantity of prevention of vertical transmission of HIV services delivered at health facilities and in the community, (2) facility- and association-level motivation and workplace environment factors, and (3) health workers' job satisfaction and intention to leave. Although our study was underpowered to detect an impact of PBIs on the quantity of services delivered, our strong mixed methods evaluation identified increased collegial support and empowerment of facility workers to overcome some systematic barriers in the health system as ways along the pathway in which PBIs may lead to improved health worker performance. Furthermore, PBIs may have buffered against increases in frequency of thoughts of leaving at intervention facilities and decreases in feeling job insecure amid background of administrative transition.

Our findings regarding *how* PBIs impact pathways to service delivery align well with the limited reports in the literature that have included attention to the pathway. Speak et al (2016) attributed PBI success in part to teamwork in the Mozambican supply chain, and Paul et al. (2014) reported that in Benin, health workers were motivated by the results-based financing package featuring increased supervision, monitoring, and evaluation and not incentives alone. Similarly, our findings that increased autonomy in deciding how to use funds was motivating and contributed to workers' empowerment has been reported among hospital management in Rwanda (Janssen, de Dieu Ngirabega, Matungwa, & Van Bastelaere, 2015) and in the Central Medical Store in Mozambique (Spisak et al., 2016).

However, our study is the first to report that PBIs led to workers demanding accountability from administration and to report on workers' thoughts of leaving. Although there are differences in frequency of thoughts of leaving, intention to leave, and actually leaving, our findings are important because of the already severe health worker shortage in Mozambique.

Furthermore, our findings of health workers advocating for change from bottom-up supports the potential for broadening functional leadership in highly centralized and hierarchical health systems (Heiby, 2014).

Among community volunteers, PBIs positively impacted structured supervision and job security during a transition in administrative support. The intervention associations achieved high percentages of their goals, however these goals may not have been challenging enough given the high levels of success amid concerns about free riders. The distinction of volunteer is important because these unsalaried positions should be and are accommodating to life events that limit activities (e.g. illness, late-term pregnancy); however, we did not find evidence that PBIs empowered associations to address members who contributed little to the association goals. The PBIs did motivate association leadership and helped to buffer volunteers against concerns about association sustainability and job security during the transition to the new PEPFAR-implementing partner.

### **Contextualizing our findings**

We believe there are a number of contributing factors to our findings of no impact of PBIs on service delivery in four of the five incentivized indicators. First, the small facility sample (n=6) was reflected in the wide variation in percent change from baseline between timepoints. Second, we chose *quantity* indicators based on their importance in capturing women's movement through the cascade and their widespread use in the literature (Basinga et al., 2011; Bonfrer et al., 2014). However, *quality* measures that directly capture health workers' performance would have been more appropriate, and are increasingly used as incentivized indicators or as weights applied to final PBI funds (Bonfrer et al., 2014; Janssen et al., 2015;

Priedeman Skiles, Curtis, Basinga, & Angeles, 2012). Process indicators in problematic aspects of prevention of vertical transmission care (e.g. roll-out of new treatment approach, stock-outs) would also be appropriate and have helped to build accountability (Spisak et al., 2016). In our study, facilities' use of PBIs to incentivize women's uptake of facility care (e.g. privacy curtains, soap, electricity, etc.) may have introduced a lag time between when the improvements were introduced, when women learned of the improvements, and when women utilized them.

Furthermore, challenges to implementation may need to be worked out over time. The intervention experienced a severe delay in incentive disbursement, due to a combination of the uniqueness of PBI model, even though financial agreements had been mapped out before implementation. Even greater attention to these financial and administrative processes would have helped smoother implementation. A longer period of more than 1.5 years may be necessary in order for PBIs to impact service delivery indicators (Rajkiotia et al., 2015). Deviations from implementation that lessened the dose and may have affect the motivational pathway (Chimhutu, Lindkvist, & Lange, 2014; Ssengooba, McPake, & Palmer, 2012).

Our PBI invested very little into health system prior to our intervention and had a small budget compared with results-based financing initiatives with budgets 3-4 magnitudes greater (Bonfrer et al., 2014; Janssen et al., 2015; E. Paul, Sossouhounto, & Eclou, 2014). Our intervention was implemented in the low-resource facilities typical of the system in which most Mozambican women receive prevention of vertical transmission care and was thus conducted in a structurally difficult context.

### **Next steps in PBI research**

Theory-based evaluations using longitudinal assessments of the PBI pathway will increase the comparability of results needed to create a scientific consensus around PBIs and results-based financing effectiveness. Progress has been made on engaging theory and ethnographic analysis, with recent evaluations of innovative financing initiatives reporting their conceptual frameworks and incorporating qualitative data into their evaluations (Chimhutu et al., 2014; Ssengooba et al., 2012; Waweru, Goodman, Keding, Tsofa, & Molyneux, 2016). However, our study is the first to longitudinally assess health worker motivation and a variety of key workplace factors qualitatively and quantitatively. Careful timing of quantitative and qualitative assessments throughout the intervention implementation (e.g. prior to and after incentives are disbursed) is necessary to better isolate the pathway by which PBIs lead to changes in healthcare delivery. Furthermore, reporting on how incentives are allocated and applied can further shed light on how resources affect the pathway.

Improvements to the performance metrics used in PBI studies are necessary to show impact, understand the mechanisms leading towards that impact, and compare findings so that a weight of evidence can be built. We need to choose indicators that actually measure activities within health workers' control. Incentivizing the number of prevention of vertical transmission services delivered relies heavily on the behavior of HIV-infected pregnant women and mothers, who are influenced by numerous factors in their lives beyond the quality of care delivered by health workers. Furthermore, choosing progressively challenging goals that reflect the complexity of the health system is one more way in which performance-metrics can be enhanced (Spisak et al., 2016).

Finally, evaluations can be used to monitor the sustainability of PBI effects on motivation. Monitoring motivation and workplace environment factors throughout an

intervention are ways to better understand and guard against distortive effects. Our study found intrinsic motivation and satisfaction with social recognition started and remained high and satisfaction with compensation started and remained somewhat low for facility-based health workers and community volunteers in both districts, suggesting distortions did not occur during the intervention implementation period. As to the sustainability of PBI funding, many results-based financing interventions replace traditional funding structures and would continue to draw on the same funding sources currently supporting the health systems. In contrast, PBIs layered on top of health system funding may need to show larger impacts on services, health outcomes, and cost-effectiveness to support continued funding.

For example, our study found intrinsic motivation and satisfaction with social recognition started and remained high and satisfaction with compensation started and remained somewhat low for facility-based health workers and community volunteers in both districts, suggesting no distortions occurred during the intervention implementation period. Third, the source of funds for PBIs is a sustainability issue. This proof-of-concept was conducted at a time when the Mozambican Ministry of Health was considering implementing results-based financing. Many results-based financing interventions replace traditional funding sources and would rely on the same mix of funders as currently supporting health systems in low-resource settings. However, PBIs layered on top of health system funding may need to show larger impacts on services and, more importantly, health outcomes, as well as cost-effectiveness to support continued funding.

## **Limitations**

Although our study was strong in its mixed methods and participatory approach, we nonetheless had four important limitations. We did not collect patient or health worker

individual-level data from health facilities because it was felt to be too resource-intensive by our implementing partner and concerns about data completeness were present. The small facility sample size (n=6) vs. individuals (n=120) meant that we were underpowered for our analyses. Furthermore, we reported the service delivery response as a percent from baseline to accommodate the differences in catchment area population served by the facilities. This can be problematic when the number of services delivered is low. For example, for facility births, a 10% increase from baseline could be 6 births at a district facility and <1 child for a small peripheral facility, contributing to the variation observed in our mixed effects models. Finally, the baseline year upon which the 10% increase goals may have been subject to year-to-year variation, which was unaccounted for.

Facilities and associations in the control district were less engaged in the goal-setting process, due to a combination of less facilitated interactions by the research team and less interest in dedicating time and resources without an incentive, as this was an unmasked treatment. Lower engagement of comparison facilities due to perceived unfairness of not receiving incentives has been reported elsewhere (Ssengooba et al., 2012). However, since we did not find a positive impact of PBIs on service delivery, we conclude that this bias did not play a significant role in our results.

Our intervention experienced challenges to implementation fidelity. The delay in disbursement of earned PBIs, poor timing of midpoint and endline surveys (when goal achievements had been reported but workers did not necessarily have incentives in hand) may have diluted the dose of the intervention. Since previous experience with prior outcomes affects motivation and effort towards those same actions, this could have negatively affected the feedback loop to motivating workers for the next round of PBIs.

Finally, due to resource limitations the data were not independently validated by checking with service recipients. Although PBIs introduce concerns about gaming and manipulation of reporting (Ireland, Paul, & Dujardin, 2011), we believe this bias was unlikely since we did not see a positive impact on number of services delivered.

## **CONCLUSIONS**

PBIs improved key aspects of workplace environment and reduced thoughts of leaving and increased feelings of job security among facility- and community-based health workers in Mozambique. To see impact on performance, future facility-based PBI interventions should incentivize quality- and process-based indicators that capture actions within the health worker's control. Furthermore, well-timed longitudinal assessment of workplace factors, including evaluative ethnography, are necessary to capture how PBIs lead to changes in service delivery, and ultimately, health impact.

## **Contributions**

Roseanne Schuster and Sera Young led study design, with input from Delphine Pinault and Octávio de Sousa. Octávio de Sousa and Delphine Pinault led implementation, with input from Roseanne Schuster and Sera Young. Roseanne Schuster and Octávio de Sousa led qualitative and quantitative data collection, to which Anne-Kathe Reme and Carolyn Vopelak contributed significantly. Roseanne Schuster conducted qualitative and quantitative data analyses, with statistical guidance from Lynn Johnson for service delivery indicators and intermediate constructs. David Pelletier provided important input on interpretation of results.

Mduduzi Mbuya supported implementation of the motivation, workplace environment, and job satisfaction survey and interpretation of results.



## CHAPTER 5

### CONCLUSIONS

Findings from this rigorous mixed methods evaluation contribute to our understanding of how PBIs can be used to support and empower health workers to address barriers to delivering care to HIV-infected women and their HIV-exposed children. Although Mozambique has made important progress in increasing access to antiretroviral therapy for (Franco et al., 2002)HIV-infected pregnant women and mothers and decreased incidence of vertical transmission from 20% in 2011 to 12% in 2013 (CNCS, 2012; UNAIDS, 2014a), more headway is needed and some of it can be accomplished by strengthening key aspects of the health system. Our research is important at time when funders for low-resource health systems are increasingly scrutinizing the impact of funding.

Indeed, our research on PBIs in Mozambique is particularly timely given that the International Monetary Fund and the World Bank announced in late April 2016 that they would suspend lending and direct financial aid to Mozambique following hidden debt and corruption charges (Wernau & Wirz, 2016). In Mozambique, grants and loans account for 30% of the total national budget and 66% of total health expenditures (WHO, 2012a). In July, the government froze spending with the exception of salaries and pensions in an attempt to cut the budget by 10% and weather inflation that is projected to rise 16.7% during the year (News, 2016). Government health workers have reported delays in salary payment, while money flowing through international NGOs reaches health facilities (Octávio de Sousa, personal communication, June 24, 2016).

## **Summary of research findings**

Our literature review (Chapter 2) highlights the complex and multi-level barriers that health workers face in delivering care to HIV-infected pregnant women and their HIV-exposed children. The greatest percentage of reported barriers affected workers' opportunity to deliver care, more so than their motivation or ability. From the study objectives and findings in our review, we see more focus on the higher ecological levels that health workers operate within. This suggests that biomedical and institutional knowledge has amassed in the recent decades of preventing vertical transmission of HIV and thus attention has shifted from health workers' abilities to the limitations of their health system (Schuster, McMahon, & Young, 2016b). Along with health worker burnout and stress, the greatest threat to worker motivation may be the systemic barriers that limit their opportunity to deliver quality care (e.g. poor record and referral systems, poor physical infrastructure). These findings are important to consider in the current health and nutrition research landscape where interventions focusing on particular health outcome (e.g. child growth, preventing vertical transmission of HIV) often recommend additional actions by the health worker (e.g. new counseling approaches on exclusive breastfeeding). These recommendations may introduce burdens in the form of additional training, time spent with patients, and documentation. However, health workers' baseline performance and additional tasks may face even greater challenges from the many other levels in the health system beyond time and ability.

When applying this lens to rural Mozambique, we found that facility-based health workers' opportunity to deliver prevention of vertical transmission services was similarly challenged at ecological levels beyond the individual (Chapter 3). While dissatisfaction with

remuneration was present, that was not necessarily the main barrier to performance, as one intrinsically motivated nurse eloquently pointed out:

*“I don’t believe that increasing our salary would help improve the activities, because if I say this it means that I am accepting that we are holding back care for some women because we receive little [money]. Financial support could be used to help me as an individual, but it is not a way to improve the activities”*  
(Nurse 483; Chapter 3).

Our findings add more evidence to the burgeoning literature suggesting that there is an indirect pathway by which PBIs leverage motivation to increase quantity and quality of care (Fox et al., 2013; Janssen et al., 2015; E. Paul et al., 2014; Spisak et al., 2016). In this context of systematic challenges, we found PBIs to be appropriate to address some of the health systems barriers from the ground up instead of accepting administrative practices that obstruct service delivery as the norm. Specifically, our PBI intervention identified specific ways in which PBIs motivate health workers to address health systems barriers that prevent them from delivering quality care in maximum quantities (Chapter 4). We found that PBIs increased motivating and structured supervision, collegial support, and workers’ empowerment to address administrative barriers. While it is not the responsibility of frontline workers to mitigate systemic barriers, particularly when there is bureaucracy in place with the explicit objective of maintaining health systems function, we have demonstrated that demands from motivated frontline workers can and do inspire important changes with great potential impact for the health system. This line of thinking is worthy of further innovation in the design of PBI goals and evaluation of their effectiveness.

Another finding from this dissertation was that lack of integration with the facility-based health system limits meaningful contributions of community-based health workers to play their roles in the prevention of vertical transmission (Chapters 2 and 3). In the context of PBIs,

supervision and the corresponding social recognition remain untapped sources of extrinsic motivation (Chapters 3 and 4). Already overtaxed health systems may find it difficult to commit the human and financial resources to provide additional supervision or structure to these cadres of health workers (e.g. community health workers, community volunteers, traditional birth attendants). However, since community-based health workers are already important components of the health system in many countries thanks to task-shifting initiatives, this is necessary in order for the health system to capitalize on the full potential of community-based workers. Engaging mobile technology to support community health workers and enhance motivation and supervision is one promising strategy currently under investigation in Mozambique and Uganda (Kallander et al., 2015).

Furthermore, appropriate compensation of community-based health workers is necessary so as not to take advantage of intrinsically motivated individuals, who are members of the community and may be experiencing poverty themselves (Maes, Kohrt, & Closser, 2010). Similar to the literature on facility-based workers, we found that community volunteers' feelings of job security and investment in the sustainability of their association were important. Maintaining a degree of certainty to the funding of community-based workers is certainly challenging in low resource health systems, but again, will help keep intrinsically motivated workers engaged and support local continuity of care, particularly when facility-based health workers tend to transfer within the public health system and outside of it.

## **Contributions to the field of performance-based incentives**

### *Study design*

While much of the literature on results-based financing has focused on large-scale systems, our study design is a small-scale PBI intervention layered on top of the standard health system funding and may be viewed as a pilot for transitioning into a more global results-based financing approach. Our PBI intervention had negligible up-front investment in the health system, smaller incentive amounts, and shorter duration than many other PBI and results-based financing interventions that have been implemented in sub-Saharan Africa in the past 13 years (Table 5.1).

*Strengths.* We responded to key concerns in the literature regarding PBI design by using a participatory approach to our intervention design, which lead to more ownership and empowerment among health workers. Health workers, facility leads, and district administrators were engaged in our iterative intervention design process, including choosing indicators, selecting the goals, and discussing general preferences for split of incentives between facility and individuals. The resultant feelings of ownership, documented in our accompanying ethnographic work, were important to our conceptual framework. In contrast, in other settings lack of ownership and decreased engagement featured in a results-based financing initiatives that found no impact (E. Paul et al., 2014).

Our study is one of the first to report on a PBI intervention engaging both facility- and community-based health workers to strive towards the same goal. Rwanda strengthened its national community health worker program as part of its community results-based financing initiative (Condo et al., 2014; Mugeni et al., 2011), and one facility-focused results-based financing study reported facility-based workers increased contact with traditional birth attendants

and traditional medical practitioners in order to achieve service delivery targets (Chimhutu et al., 2014). Similar to our findings, community health workers engaged in PBIs want more supervision (Condo et al., 2014; Strachan et al., 2015).

*Limitations.* Our PBI intervention did not provide enough structure to facilitate improvements in the areas we identified PBIs to have potential: improved record and recording systems, increased levels of supervision, and structured engagement of community volunteers with the health system. Furthermore, our PBI intervention would have benefited from increased engagement from provincial administration to encourage accountability and timely disbursement of incentives with district administrators and could have included stronger incentives for management.

While our integration of both facility- and community-based health workers into the PBI was a strength, our proof-of-concept could have gone further to integrate the cadres. For example, while a member of each community association participated in facility-wide ART meetings, more structured contact with maternal and child health nurses would have been appreciated. With our limited human resources, it may have been wiser to focus on a PBI intervention with either the facility- or the community-based health workers instead of both, in order to lay groundwork for the areas where PBIs hold the most potential.

**Table 5.1.** Impact and pathway findings from results-based financing and performance-based incentive interventions in sub-Saharan Africa, organized by country

Country	Citation	Year(s) conducted	RBF type, scope, and budget	Objective	Study design (scale in province, districts, HFs)	Methods (sample size of facilities, workers, end users)
Benin	Paul, Sossouhounto, & Eclou, 2014	Devel-oped in 2008	Two RBF approaches: World Bank (\$18 million over 3 years, \$2.17pp/yr); Belgian Development Agency (\$1/pp/yr)	To document stakeholder perceptions of RBF, how adapt, behavioral interactions induced	Case study of each approach (n per district= 1 hospital, 5-6 HFs)	SSIs with District Health Management (n= ), technical assistant for each approach
Burkina Faso	Ye et al., 2016	2010	Formative work for development of RBF	To assess HW preferences of incentive scheme based on local resources for MCH care	Baseline data in 1 intervention district (n=1 hospital, 33 dispensaries)	HW survey (n= 94), key informant IDIs (n=33)
Bu-rundi	Bronfrer et al., 2014	2006, 2008, 2010	RBF with nationally staggered implementation; 40% of health budget and 4.5 fold increase in facility revenue	To evaluate effects of RBF on MCH care	Repeated cross-sectional in 4 provinces in 2006, 11 provinces in 2008 & 2010	Clustered random sample; HH surveys on maternal and child use and satisfaction with care (n= 1,350); 57-item HF quality score (n=75 HFs)
Congo	Soeters et al, 2011	2005-08	World Bank funded contract-based RBF; subsidies of \$200-\$4000/HF with max. 15% bonus for quality	To evaluate contract-focused RBF on health system failed state of DRC	Controlled pre-post in 2 intervention & 2 control districts (n=4 hospitals, 39 HFs, 22 private HFs)	Pre-post HH surveys (n=440) to assess service use and perceived quality; 53 HF qualitative indicators
Congo	Fox et al., 2013	RBF 2008-2009; evaluation Oct-Dec 2010	World Bank funded RBF; contributed 52% of HF revenues (maximum \$40,000/year/zone); highly variable across HFs and 3 implementing NGOs	To evaluate how RBF affects health worker pay and motivation; to inform conversation on preconditions in fragile states	Cross-sectional mixed methods evaluation of RBF + reduction in user fees in capital city and 1 province (7 zones, or n=152 HFs)	HFs across three implementers; government expenditure data, data on donor activities, IDIs with HWs (n=67), checklists, service delivery data
Mozambique	Rajkotia et al, 2015	2011-13 (maximum 33 mo.)	RBF led by PEPFAR-implementing partner; quarterly evaluation	To assess impact of RBF on HIV, PMTCT, MCH outcomes	Retrospective observational study in 2 intervention and 2 control provinces (n=134 facilities)	Difference in difference for 18 indicators for HIV, PMTCT, MCH
Mozambique	Spisak et al., 2016	2013 (12 mo)	PBI in Central Medical Store; \$500,000 (\$125,000/quarter) external to health system funding	To evaluate impact of PBIs on (1) staff motivation, attendance, job performance; (2) collaboration; (3) investment in supply chain infrastructure	Mixed methods prospective pre-post evaluation in the commodity supply chain	Quantitative assessment of 5 indicators for supply planning, distribution planning, warehouse management (n=3 hubs)
Rwanda	Basinga et al., 2011	2006-08 (23 mo.)	RBF; quarterly evaluation; 22% increase of national budget; increased control budget	To evaluate use and quality of MCH services	Difference-in difference; (n= 80 intervention & 86 control HF)	Surveyed facilities (n=166) and HH (n=2,158) at 23 months

**Table 5.1. continued**

Citation	Impact	Main findings	Pathway	What says about PBIs	Reported theory
Paul, Sossou-hounto, & Eclou, 2014	n/a	RBF supported but not well integrated; local stakeholders don't feel ownership; increase in staff satisfaction, welcoming and quality for patients; decreases in absenteeism	Yes	RBF motivates not by incentives but complete package (featuring supervision). Burden of duplication of M&E tools. Perceived unfairness of RBF for some staff in less-incentivized program	"incentive theory"
Ye et al., 2016	n/a	85% HWs favor incentive scheme using district's own resources. 95% and 96% of HWs favored financial and team-based incentives.	Yes		No
Bronfrer et al., 2014	Yes	+21% institutional delivery, +7% ANC, +5% family planning; no change in vaccines or differential effects across socioeconomic groups; mixed effects for quality	No	Unable to disentangle RBF from increase in HF resources; did not study effects on non-incentivized services. Unlikely to improve equity without accompanying access incentives for the poor.	No
Soeters et al, 2011	Mixed	Quality of care as perceived by patients higher in intervention districts but no significant trends on service uptake	No	RBF enhanced transparency and reduced corruption	No
Fox et al., 2013	No	No benefits in service inputs, processes, or outputs. Very, very low levels of equipment at facilities, 10% absenteeism, only 59% of staff received allowance.	Yes	Need wider financing and human resource policy reforms for RBF to be effective. HW motivation can't be taken for granted; incentive effects muted in donor-dependent context	No
Rajkotia et al, 2015	Yes	Positive impacts on MCH, PMTCT, pediatric HIV outcomes. Average 6 quarters to take effect; sustained after. Indicators not sensitive to price but inversely to effort.	Unclear	Unclear; perhaps takes time to work out challenges to implementation	No
Spisak et al., 2016	Yes	Achieved timely submission targets for supply and distribution but not warehouse planning; process improvements in accuracy, order cycle times, and collaboration between departments.	Yes	Autonomy to spend funds motivated, strengthened data collection, encouraged teamwork. Need to shift attention from quantity to quality indicators, improve verification, and institutionalize approach	"carrot + stick"
Basinga et al., 2011	Yes	+23% facility delivery, +56% preventative visits for child <2yr, +132% visits child 24-59mo., increased ANC quality; no effect 4 ANC visits or full child immunization	No	RBF had greatest effect on services with highest payment rate and least effort from service provider.	No



**Table 5.1. continued**

Country	Citation	Year(s) conducted	RBF type, scope, and budget	Objective	Study design (scale in province, districts, HFs)	Methods (sample size of facilities, workers, end users)
Rwanda	deWalque, 2015	2006-08; (20 mo.)	RBF; quarterly evaluation; 22% increase of national budget	To measure impact of RBF on individual and couples' HIV testing	Prospective quasi-experimental design (n=10 intervention & 14 control HF)	Surveyed facilities, HHs with HIV-inf person (n=1,200) and neighbor HHs in catchment area (n=400)
Rwanda	Janssen et al., 2014	2006-2010	RBF; quarterly evaluation; 22% increase in national budget	To evaluate impact on quantity and quality of services and to document lessons learned	Retrospective descriptive study, uncontrolled (n= 4 intervention district hospitals)	52 indicators for management, support to health facilities and clinical activities; services validated by record completeness
Rwanda	Skiles et al., 2015	2005 DHS & 2007-08 DHS	RBF; quarterly evaluation; 22% increase in national budget	To evaluate impact of RBF on less-incentivized child services (prevention of illness, care seeking behavior) and impact by HH poverty	Difference-in-difference, retrospective community level panel dataset from Demographic & Health Survey (n= 19 districts)	Panel dataset of children < 5 years (n=5,781). Analyses accounted for community fixed effects and poverty*RBF term
Tanzania	Binyaruka et al., 2015	2012-13 (13 months)	PBI bonuses based on achieving MCH targets; Max payout/cycle \$820/dispensary, \$3,220/facility, \$6790/hospital; 50% paid for 75% target achieved, full for 100%.	To evaluate effect of government PBI scheme on utilization, quality, user costs of health services in Tanzania	Difference-in-difference analysis in 7 intervention and 4 comparison districts (n=150 HFs)	HH surveys to assess population coverage of MCH services (n=3,000), MCH patient exit interviews (n=1,500); HF service utilization
Tanzania	Chimhutu et al., 2014	2010-11 (15 months)	PBI bonus; \$676/dispensary, \$2,000/HF, \$6,000/hospital; implemented by government locally after donor discouraged due to perceived unreadiness	To describe HW strategies to reach MCH targets and how interventions are implemented locally	Qualitative interviews before and after RBF payments	IDIs with nurses, clinic officers, medical attendants, lab techs, district health administrators (n=28)
Uganda	Ssengooba, McPake, Palmer, 2012	2003 planning, 2004-2006 implementation	PBC; with percentage increase in 1 year comp to previous year baseline, among private nonprofit HFs. 5-10% increases; 6 month evaluation	To describe PBC intervention, mechanism, evaluation, and potential effects	Theory-based case study of a prospective quasi-experimental design implemented in 5 of 56 districts (n=120 HFs)	IDIs with hospital management (n=28) across 7 hospitals (n=2 intervention & 5 control)

**Table 5.1. continued**

Citation	Im- pact	Main findings	Path- way	What says about PBIs	Reported theory
deWalque, 2015	Yes	+10.2%+ HIV testing married couples, +14.7% among discordant couples	No	Unable to disentangle RBF with general scale-up of HIV services.	No
Janssen et al., 2014	Yes	Improved quality and hospital management; induced behavioral changes to take initiative (e.g. appropriate archiving, staff recruitment, welcoming for patients)	Yes	Peer evaluation resulted in shared learning. The hospital that did not see management improvement had high staff turnover, indicating leadership critical to success.	"carrot + stick"
Skiles et al., 2015	Mixed	RBF improved quality (completeness) of treatment received by poor children but did not impact their propensity to seek care; no effect on morbidity and mortality or overall services delivered compared to control	No	RBF incentivizes staff through quality of services but does not influence demand; need to focus on supply and demand with attention to poverty-related barriers if RBF to be equitable; CHWs may help to increase demand for services	No
Binyaruka et al., 2015	Mixed	Positive effect in 2 of 8 targeted indicators (+8.2% institutional delivery, +10.3% anti-malarial during pregnancy); -35% in non-incentivized visits children <5yr and -33% in visits/mo. for patients ≥5yr	No	Potential risks for non-targeted service use; close monitoring on these services and user costs encouraged. Important to look at spillover effects.	No
Chimhutu et al., 2014	n/a	PBI implementation deviated from plan due to low resources and perceived unfairness; incentives not linked to performance. HWs increased education efforts, improved staff attitudes, cooperated with TBAs & TMPs, and used "coercive" behaviors (e.g. withhold clinic cards/child vaccines, fines) to get mothers to do desired behaviors.	Yes	Care must be taken to understand the strategies HWs may employ to achieve performance goals that may be largely determined by patient behavior and adverse effects; RBF design may change when implemented locally	Principal agent
Ssengooba, McPake, Palmer, 2012	No	Implementation challenges following inadequate design and hasty adaptations (e.g. 'locked-in' to indicators); learning curve & workload of auditors weakened audit validity; financial shortfalls led to delays and uncertainty about bonus payment	Yes	Quality PBC requires strengthening local institutions, consideration of the responses of multiple actors to the intended change process, and realization PBC is embedded in complex health system and assumptions of simple causal change are unrealistic	Complex adaptive systems; expectancy

Abbreviations. **Types of interventions:** PBI - performance-based incentive; RBF - results-based financing; PBC - performance-based contracting. **Other terms:** CHW - community health worker; FGD - focus group discussion; HF - health facility; HW - health worker; IDI - in-depth interview; KIs- key informant; MCH - maternal and child health; SSI - semi-structured interview; TMP - traditional medical practitioner

## *Evaluation*

The literature recognizes how inherently context-specific PBI and results-based financing initiatives are and how this challenges their comparability (Witter et al., 2012). While the research presented in this dissertation is no different, our strong evaluation is an example of an approach to codify context-specific aspects, thereby identifying key design and implementation factors on which PBI interventions can be compared. Our PBI study is one of the first to respond to the call for reporting on the context, study design, implementation, and health system effects made by Witter et al. (2013) for improved monitoring and evaluation of results-based financing initiatives.

*Strengths.* Our formative work documents the context in which prevention of vertical transmission of HIV services were being delivered in rural Mozambique, including the challenges at the work mandate, health systems, and higher-up (Chapter 3). We identified key contextual factors that would affect PBI operation and where the PBI could impact the health system. For example, we learned that health workers and facility leaders often lacked decision-making autonomy for their facilities, which the PBIs introduced in terms of prioritization of funds. Furthermore, facilities were unauthorized to have their own bank account, which did affect PBI fund disbursement.

Another evaluation strength was our utilization of existing monitoring and evaluation processes in order to avoid duplication of efforts, although we may have missed opportunities to invest in monitoring and evaluation strengthening processes at the facility levels. Burden of duplication of evaluation has led to poor quality audits of results-based financing initiatives (E. Paul et al., 2014),

The greatest strength of our PBI intervention was our longitudinal assessment of health worker motivation and key workplace factors, which to our knowledge is the first. Our mixed method approach addresses the gap in structured qualitative evaluation of PBI initiatives and gets closer to answer the largest remaining main question, which relates to the mechanisms by which PBIs affect service delivery. An understanding of mechanisms is essential for interpreting the positive and negative findings from impact evaluations and strengthening intervention design in the future.

*Limitations.* We did not assess the context for accountability mechanisms prior to starting this intervention. While health workers were empowered to bring accountability to some administrative obstacles, a better understanding could have circumvented that or even been brought to address other delays in delivery of medications and food, particularly to the peripheral facilities.

### **Future research directions**

In conclusion, PBIs have potential to improve key aspects of facility- and community-based health workers' workplace environment and thus can play an important role in health systems strengthening. We posit that, with careful thought to their design, implementation, and evaluation, greater impact can be made in reducing the burden of vertically transmitted HIV while increasing health delivery. Three key areas for future research with PBIs include more meaningful integration of community-based health workers, more appropriate measures of facility-based workers' performance, and improvements in longitudinal assessments that capture timing of incentive disbursement.

We present a summary of our recommendations for implementation and evaluation of future PBI interventions in the form of a checklist:

- Engage health workers, management, and administrators in study design using a participatory approach, and community advisory bodies where appropriate
- Moving beyond a conceptual framework towards a very detailed “Theory of Change” that charts expected outcomes at each step of implementation along with unintended consequences
- Engage of multiple levels of administration through the use of structured incentives
- Utilize indicators that directly capture health workers’ actions as measures of performance
- Longitudinally assess health worker motivation, satisfaction with workplace environment constructs, job satisfaction and intention to leave using mixed methods approach in order to monitor effects and sustainability of PBIs, including distortion of motivation

In order for any form of “performance-enhancing” activities to work, performance must be measured accurately. In reviewing the PBI and results-based financing studies conducted in sub-Saharan Africa (Table 5.1), the majority of impact-focused studies evaluate “performance” as number of services delivered, with some including quality measures. Two interventions stand alone in incentivizing process indicators for planning and management, including timely submission of reports (Janssen et al., 2015; Spisak et al., 2016). Incentivizing actions that are within a worker’s job mandate lends credence to the notion of “performance-based,” as opposed to incentivizing indicators for which a significant part lies outside health worker’s control (e.g. patient presenting at facility). Furthermore, incentivizing accountability through these process

indicators will make explicit one of the indirect goals of PBIs, contributing to the strengthening of the health system.

Recommendations for evaluation of results-based financing interventions starting with study design have been laid out (Witter et al., 2013). In line with these recommendations to elucidate the PBI pathway, pathway-focused papers were retrospectively published following results-based financing initiatives that “failed” in terms of impact but were enlightening in their theoretically-grounded, implementation-focused analyses (Chimhutu et al., 2014; Ssengooba et al., 2012). While these saw positive results in terms of process indicators, as described in the preceding paragraph, only one study was evaluated longitudinally (Spisak et al., 2016). Therefore, along with the many other topics for future PBI research, we particularly recommend expansion on longitudinal assessments of pathway factors that account for the timing of incentive disbursements to the facility and then into the hands of the individual health workers.

## APPENDIX A

### Comprehensive literature review search strategy

Summary of search terms used to generate the comprehensive review of barriers and facilitators health workers encounter in delivery of prevention of vertical transmission services in sub-Saharan Africa

Barriers and facilitators		HIV		PVT		Health Workers		sub-Saharan Africa
role*[tw] OR activit*[tw] OR impact*[tw] OR social change[tw] OR evaluat*[tw] OR effectiv*[tw] OR constrain*[tw] OR barrier*[tw] OR impediment[tw] OR obstacle[tw] OR facilitat*[tw] OR promote*[tw] OR enable*[tw] OR challenge*[tw] OR implement*[tw] OR deliver*[tw]	AND	HIV Infections[MeSH] OR HIV[MeSH] OR hiv[tw] OR hiv-1*[tw] OR hiv-2*[tw] OR hiv1[tw] OR hiv2[tw] OR hiv infect*[tw] OR human immunodeficiency virus[tw] OR human immunodeficiency virus[tw] OR human immuno-deficiency virus[tw] OR human immune deficiency virus[tw] OR ((human immun*) AND (deficiency virus[tw])) OR acquired immunodeficiency syndrome[tw] OR acquired immunodeficiency syndrome[tw] OR acquired immunodeficiency syndrome[tw] OR acquired immunodeficiency syndrome[tw] OR ((acquired immun*) AND (deficiency syndrome[tw])) OR “sexually transmitted diseases, viral”[MESH:NoExp]	AND	mother-to- child[tiab] OR mother to child OR MTCT[tiab] OR mother-to- infant[tiab] OR mother to infant OR adult-to-child[tiab] OR maternal-to- child[tiab] OR vertical transmission[tiab] OR perinatal transmission[tiab] OR peri-natal transmission OR postnatal transmission[tiab] OR post natal transmission[tiab] OR maternal-infant transmission[tiab] OR PMTCT[tiab] OR infectious disease transmission, vertical/prevention and control[MeSH] OR (vertical transmission[MeSH] AND breast feeding[MeSH])	AND	Community Health Worker [MeSH] OR Community Health Worker [tw] OR Health Worker* Community[tw] OR Community Health Aid*[tw] OR Family Planning Personnel[tw] OR Village Health Worker*[tw] OR Barefoot Doctor*[tw] OR Lay Health Worker*[tw] OR Health Volunteer*[tw] OR Health Communicator*[tw] OR Health Personnel [MeSH] OR nurs*[tw] OR physician*[tw] OR doctor*[tw] OR general practitioner[tw] OR pharmacist*[tw] OR medical staff[tw] OR hospital staff[tw] OR facility-based staff OR health center staff OR Midwifery [MeSH] OR midwi*[tw] OR traditional birth attendant*[tw] OR TBA[tw] OR birth attendant[tw]	AND	Sub Saharan Africa[MeSH] OR Angola OR Benin OR Botswana OR Burkina Faso OR Burundi OR Cameroon OR Cape Verde OR Central African Republic OR Chad OR Comoros OR Congo OR Democratic Republic of Congo OR Djibouti OR Equatorial Guinea OR Eritrea OR Ethiopia OR Gabon OR Gambia OR Ghana OR Guinea OR Guinea Bissau OR Kenya OR Lesotho OR Liberia OR Madagascar OR Malawi OR Mali OR Mauritania OR Mauritius OR Mozambique OR Mocambique OR Namibia OR Niger OR Nigeria OR Principe OR Reunion OR Rwanda OR Sao Tome OR Senegal OR Seychelles OR Sierra Leone OR Somalia OR South Africa OR Sudan OR Swaziland OR Tanzania OR Togo OR Uganda OR Western Sahara OR Zaire OR Zambia OR Zimbabwe OR Central Africa OR Central African OR West Africa OR West African OR Western Africa OR Western African OR East Africa OR East African OR Eastern Africa OR Eastern African OR South African OR Southern Africa OR Southern African OR sub Saharan Africa OR sub Saharan African OR subSaharan Africa OR subSaharan African NOT (guinea pig OR guinea pigs* OR aspergillus niger)

## APPENDIX B

### Semi-structured interview guide for health workers (English translation)

#### I. Work history

How long have you been working as a [type of health worker]?

How did you become trained in your job?

*When?*

*Who trained you?*

*What sort of training did you receive to do your work?*

*How long was the training?*

Do you still have trainings or updates for your work?

*Can you describe them to me?*

Does provide supervision or support for you?

*Who?*

#### II. Responsibilities

What are all the responsibilities of your work?

How many people do you see in a typical day?

*Does the number of people that you see differ by the season? If yes, how or why?*

When you see patients, could you tell me what a typical workday is like for you?

[FOR COMMUNITY-BASED WORKERS]: How do you identify your patients?

Do patients give you or thank you in some way for the services?

*Why or why not?*

How many weeks or months into their pregnancy are women when you start working with them?

Do you talk with them before their baby is born about getting health care for themselves or their baby after the baby is born?

*What do you say?*

*How do they respond?*

Do you talk with the women after their baby is born about their or the baby's health?

*What do you say?*

*How do they respond?*

What is your role in preventing vertical transmission of HIV?

What other work do you do that is related to HIV?

Do you also help to care for those who are HIV-infected?

*How?*

Do you ever give advice on getting an HIV test?

*What do you say?*

*How do they respond?*

Do you ever give advice on taking HIV medicines?

*What do you say?*

*How do they respond?*

Do you ever give advice on breastfeeding?

*What do you say?*

*How do they respond?*

*What about exclusive breastfeeding?*



Do you ever give advice on family planning?

*What do you say?*

*How do they respond?*

What challenges do you think women face in accessing the services they need to keep themselves healthy?

*Their babies?*

*Their babies free of HIV?*

*What do you think would help them to get those services?*

Do you have other jobs besides being a [type of health worker]?

*What is it/are they?*

*How much time do you spend per week on your other jobs?*

*Which job do you like best and why?*

### **III. Colleagues**

How do you interact with other [type of health worker]?

*When?*

Who are all the other people you work with who also help to prevent vertical transmission of HIV?

*What is your relationship with them?*

*[Probe on]: health facility reception, nurses, community health workers, traditional birth attendants, activists*

What opportunities do you see to work more closely with any of these groups in keeping women and babies healthy?

*What would help you to do this?*

### **IV. Motivation and factors affecting performance**

What led you to begin this work as an \_\_\_\_\_?

What motivates you to *continue* to do this work?

What do you like about your job?

What do you not like about your job?

When do you feel satisfied in your job?

*Can you give an example or two of a time you felt especially happy and proud in your job?*

When do you feel dissatisfied in your job?

*Can you give an example or two of a time you felt unhappy to be doing your job?*

What makes it difficult to do your work? Why?

*[Probe on]: distance from health center, distance from patients, costs, wages, other responsibilities at home, stigma, time spent*

What would help you to do your work?

*[Probe on]: financial support, supplies, social recognition, additional training, supervision*

### **V. Wrap-up questions**

What else should we know about the care of pregnant and recently-delivered women in this

region?

What else should we know about the care of women living with HIV in this region?

Do you have any children yourself?

What has been your experience with exclusive breastfeeding?

Do you actively promote exclusive breastfeeding?


What is your personal experience with HIV?

## APPENDIX C

### **Community volunteer data collection sheet**



Visitas o cuidados domiciliarios com mulheres grávidas HIV+; Promoção de PTV e consultas pré-natais e partos na maternidade



Visitas o cuidados domiciliarios com mães ou pessoas que cuidam das crianças expostas a HIV;  
 Promoção de PTV e serviços pós-natais



Visitas e aconselhamento aos parceiros/família das mulheres grávidas HIV+ e crianças expostas a HIV

[illegible]

APPENDIX D  
Motivation, workplace environment factors, and job satisfaction survey

**Começando Saudável: Health worker survey – Nurse or Counselor**

**A. DEMOGRAPHICS.** First, we want to ask you demographic questions that describe you.

Nº	QUESTIONS	CODES
A1	What type of health care worker:	<u><b>Health Center</b></u> (1) MCH Nurse (2) Other Nurse (3) Counselor in area of _____ (4) Midwife (5) Technician in the area of _____ (6) Medical doctor (7) Other: _____
A2	What is your gender?	(1) Female      (2) Male
A3	What is your preferred language for the survey?	(1) Portuguese      (2) Xitswa      (3) Ndaou
A4	How old are you?	_____ years
A5	What is your household status?	(1) Single      (3) Separated/Divorced (Skip 6) (2) Married      (4) Widowed (Skip 6)
A6	Do you live with your partner?	(0) No      (1) Yes
A7	How many children do you have?	_____ children
A8	How many people live in your house - share meals) (including you):	Adults: _____ Children under 15 years: _____
A9	Did you study in/go to school?	(0) No    (1) yes
A10	What is the highest grade of school you have completed?	A. School class _____ Old system?    (0) No      (1) Yes B. Professional Training: _____ years/months : _____ C. Post-secondary education ( <i>type</i> ): _____ How many years: _____
A11	How long have you been working as a <i>[type of health care worker]</i> :	_____ years _____ months <b>OR</b> Year started _____
A12	Where do you live?	Neighborhood: _____
A13	How long have you lived there?	_____ years _____ months <b>OR</b> Year started _____ <b>OR</b> Always (If always, Skip A14)
A14	Originally, where are you from?	City/Neighborhood: _____
A15	What languages do you speak?	(1) Portuguese    (2) Xitswa      (7) Bitonga (3) Ndaou          (4) Shongana    (8) English (5) Sena          (6) Other(s): _____

A16	What health center are you affiliated with?	
A17	What is your religion?	(1) Traditional (2) Islam (3) Catholic (4) None (5) Assembly of God (7) Methodist (6) Other: _____

<b>Q. No</b>	<b>B. JOB MOTIVATION</b>						
	From interviews with <i>[type of health worker]</i> , they told us about some of the things that motivate them to do their jobs well. The following statements are examples of the things that they told us. For each of these statements, could you please indicate <b>HOW OFTEN</b> you personally, have felt this way – <b>ALWAYS, OFTEN, SOMETIMES, RARELY or NEVER.</b> <i>Only indicate one response for each declaration. If the declaration is not applicable (N/A), circle 0.</i>						
		Always	Often	Sometimes	Rarely	Never	N/A
B1	I feel like I enjoy my work as <i>[type of health worker]</i> .	5	4	3	2	1	0
B2	I feel that my work will improve people's lives.	5	4	3	2	1	0
B3	I feel like I am adequately prepared for my responsibilities.	5	4	3	2	1	0
B4	I feel like I am responsible for so many activities that it's not possible to do them all well in the time I have.	5	4	3	2	1	0
B5	I feel connected with my colleagues.	5	4	3	2	1	0
B6	I feel supported by the other <i>[type of health worker]</i> .	5	4	3	2	1	0
B7	If I were sick, I could easily find someone to help with my <i>[type of health worker]</i> duties.	5	4	3	2	1	0
B8	I trust the advice I receive from colleagues.	5	4	3	2	1	0
B9	There is someone who gives me information to help me understand a <i>[type of health worker]</i> work's situation.	5	4	3	2	1	0
B10	There is someone I work with who I can ask advice about handling family problems.	5	4	3	2	1	0
B11	If I need help visiting patients I know that I can always get help from the other <i>[type of health worker]</i> .	5	4	3	2	1	0
B12	I have had thoughts of leaving this job.	5	4	3	2	1	0
B13	I feel that I am responsible for more work than other colleagues.	5	4	3	2	1	0
B14	I am proud to tell others that I am a <i>[type of health worker]</i> .	5	4	3	2	1	0
B15	I believe that the majority of people would promote community health and put extra effort into doing so without receiving any remuneration. (Rephrased)	5	4	3	2	1	0
B16	Effort at work is directly proportional to what I receive.	5	4	3	2	1	0
B17	I arrive work on time						
B18	I belong to a formal professional organization	(1) Yes (2) no					
B 19	The professional association that I belong to influence my professional practices	(1) Yes (2) No (3) Somewhat (0) N/A					

### C. JOB MOTIVATION AND SATISFACTION

Q. No. The following statements are also examples of the things that health workers said motivated them. This time, for each of these statements, could you please indicate HOW STRONGLY you, personally, AGREE with the statement? Do you **STRONGLY AGREE, AGREE, NEUTRAL, DISAGREE, OR STRONGLY DISAGREE**.

*Only indicate one response for each declaration. If the declaration is not applicable (N/A), circle 0.*

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N / A
C1	I am contributing to improving the conditions of the communities I am working in.	5	4	3	2	1	0
C2	I help to change behaviors in a positive direction.	5	4	3	2	1	0
C3	I received adequate training to meet my current responsibilities.	5	4	3	2	1	0
C4	I feel like I receive refresher training as often as I need it.	5	4	3	2	1	0
C5	I am involved personally in my job.	5	4	3	2	1	0
C6	I have a lot of pressure in this job. It really seems like the workload keeps increasing.	5	4	3	2	1	0
C7	I find my job to be motivating and I like to do it.	5	4	3	2	1	0
C8	I feel that the health workers in the communities (matronas, activistas, APEs) value the work that I do.	5	4	3	2	1	0
C9	I am satisfied with my allowance compared with other jobs in the same area.	5	4	3	2	1	0
C10	I am satisfied with the allowance I receive for the work I do.	5	4	3	2	1	0
C11	I am satisfied with my allowance when I compare it to that of others who have backgrounds and experience comparable to mine.	5	4	3	2	1	0
C12	Overall, I am satisfied with my job when I consider the expectations I had when I became a <i>[type of health worker]</i> .	5	4	3	2	1	0
C13	I feel secure that I will not lose my job in the near future.	5	4	3	2	1	0
C14	The community values our efforts to improve their lives.	5	4	3	2	1	0
C15	Partners and Organizations, such as NGOs, respect the work that I do.	5	4	3	2	1	0
C16	The other types of health professionals respect the work that I do.	5	4	3	2	1	0
C17	I am happy with the amount of time I dedicate to	5	4	3	2	1	0

	my job as a <i>[type of health worker]</i> .						
C18	My work as a <i>[type of health worker]</i> gets in the way of my work at home.	5	4	3	2	1	0
C19	Overall, how would you say you feel with your job? Tell me if you are very satisfied, satisfied, neutral/undecided, somewhat dissatisfied, or very dissatisfied. (CIRCLE ONE RESPONSE)	Very satisfied ..... 1 Satisfied ..... 2 Neutral/Undecided ..... 3 Dissatisfied ..... 4 Very dissatisfied ..... 5					
C20	If it were possible or if you had other alternatives, would you want to leave this job if?	No ..... 0 Yes ..... 1					

#### D. SUPERVISION

<b>D0</b>	<b>Now we are going to talk about your supervisor. Do you have a supervisor? Who is it?</b>	<hr/>					
		<i>(Write the title of the person, not their name)</i>					
	<p>Some health works have a good experience with their supervisor, others have problems. The following statements are intended to reflect the various roles that a supervisor at the health facility has. For each of the statements, please think about your direct supervisor at the health facility and indicate HOW OFTEN you have experienced each of the following behaviors with your supervisor. Tell me if you experience this <b>ALWAYS, OFTEN, SOMETIMES, RARELY, or NEVER.</b></p> <p><b>Again, please be reassured that all your responses are CONFIDENTIAL and none of the supervisors will have access to your responses.</b></p> <p><i>Only indicate one response for each declaration. If the declaration is not applicable (N/A), circle 0.</i></p>						
		<b>Alwa ys</b>	<b>Ofte n</b>	<b>Som etim es</b>	<b>Rarel y</b>	<b>Neve r</b>	<b>N/ A</b>
D1	My supervisor gives me information following-up to my concerns/worries	5	4	3	2	1	0
D2	My supervisor respects my fixed monthly activities when planning other meetings.	5	4	3	2	1	0
D3	My supervisor takes my concerns into account when planning activities that involve me.	5	4	3	2	1	0
D4	When I make a mistake on the job, my supervisor scolds me.	5	4	3	2	1	0
D5	My supervisor praises me when I do something really well.	5	4	3	2	1	0
D6	I feel that my supervisor takes my concerns up to the higher level of supervision.	5	4	3	2	1	0
D7	My supervisor uses times when I make mistakes or don't perform well as opportunities to help me improve my skills.	5	4	3	2	1	0
D8	I know who to approach when I encounter challenges in my work.	5	4	3	2	1	0
D9	My supervisor inspects the registers that I use.	5	4	3	2	1	0
D10	My supervisor gives me feedback on the registers that I use.	5	4	3	2	1	0



D11	My supervisor helps me to organize my time and activities in an efficient manner.	5	4	3	2	1	0
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**D. SUPERVISION (Continued)**

	<p>The following statements are intended to reflect the various roles that a supervisor has. For each of the statements, please think about your direct supervisor and indicate HOW STRONGLY each of the statements captures the behavior or attitude of your supervisor. Please tell me if you <b>STRONGLY AGREE, AGREE, NEUTRAL, DISAGREE, OR STRONGLY DISAGREE</b>. Only indicate one response for each declaration. If the declaration is not applicable (N/A), circle 0.</p> <p><b>Again, please be reassured that all your responses are CONFIDENTIAL and none of the supervisors will have access to your responses.</b></p>						
		<b>Strongly Agree</b>	<b>Agree</b>	<b>Neutral</b>	<b>Disagree</b>	<b>Strongly Disagree</b>	<b>N/A</b>
D12	I feel well informed by my supervisor about changes/modifications to the activities that I am involved in.	5	4	3	2	1	0
D13	I see my supervisor as often as I need to.	5	4	3	2	1	0
D14	My supervisor is easy to talk with	5	4	3	2	1	0
D15	When I disagree with my supervisor I feel comfortable to express my opinion.	5	4	3	2	1	0
D16	Having a supervisor visit me motivates me to do a better job.	5	4	3	2	1	0
D17	The way the supervisor provides feedback on my performance at work inspires me to do/be my best	5	4	3	2	1	0
D18	My supervisor's commitment to her job motivates me to do my best.	5	4	3	2	1	0
D19	My supervisor takes into account/considers my suggestions to improve things	5	4	3	2	1	0
D20	I feel that my supervisor is sympathetic to my problems and cares about my problems	5	4	3	2	1	0
D21	I constantly learn new things about maternal and child health from my supervisor (technical information)	5	4	3	2	1	0
D22	My supervisor gives me enough guidance and structure to help me do my job.	5	4	3	2	1	0
D 23	My supervisor ensures me that I have the resources that I need to do my job	5	4	3	2	1	0

The following question asks about the resources and supplies that you have for your work. For each, please tell me if you experience this **ALWAYS, OFTEN, SOMETIMES, RARELY, or NEVER**.

*Only indicate one response for each declaration. If the declaration is not applicable (N/A), circle 0.*

	<b>How often does the following affect your job performance in your community?</b>	<b>Always</b>	<b>Often</b>	<b>Some times</b>	<b>Rare ly</b>	<b>Neve r</b>	<b>N/ A</b>	
E1	Lack of medication for patients living with HIV	5	4	3	2	1	0	
E2a	Lack of prophylaxis for patients living with HIV	5	4	3	2	1	0	
E2b	Lack of other medicines	5	4	3	2	1	0	
E3	Lack of rapid test for HIV	5	4	3	2	1	0	
E4	Lack of PCR tests (for HIV)	5	4	3	2	1	0	
E5	Shortage of stationery – pen, notebook, forms	5	4	3	2	1	0	
E6	Shortage of other tools necessary for the job	5	4	3	2	1	0	
E7a	Lack of available transport during work	5	4	3	2	1	0	
E 8	Lack of lunch for health workers	5	4	3	2	1	0	
E 10	In general, how satisfied are you with the resources available at the health center you work in?	5	4	3	2	1	0	

#### **E. RESOURCES FOR WORK**

<p>The following statements are intended to reflect the self-efficacy and ways that health workers receive feedback on their work. For each of the statements, please think about your work environment and HOW STRONGLY each of the statements captures your experiences. Please tell me if you <b>STRONGLY AGREE, AGREE, NEUTRAL, DISAGREE, OR STRONGLY DISAGREE</b>.</p> <p><i>Only indicate one response for each declaration. If the declaration is not applicable (N/A), circle 0.</i></p>							
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A

**F. SELF-EFFICACY AND FEEDBACK MECHANISMS**

F1	I feel confident that I am performing very well in my job.	5	4	3	2	1	0	
F2	I find it difficult to cope with the demands of the job.	5	4	3	2	1	0	
<b>QUESTIONS</b>								
F3	How much time do you USUALLY spend doing administrative work	5	4	3	2	1	0	
G1	My supervisor tells me.							
	in a normal day?							
F4	How long do you USUALLY spend conducting one woman's first	5	4	3	2	1	0	
G3a	attitude/behavior prenatal care consultation?							
F5	How long do you USUALLY spend conducting one woman's follow-	5	4	3	2	1	0	
G3b	up prenatal care consultation?							
F6	The community members tell me	5	4	3	2	1	0	
G3c	How long do you USUALLY spend conducting follow-up prenatal							
F7	care consultation of one woman living with HIV?							
	Change in the community beneficiaries							
	knowledge, attitudes and behavior	5	4	3	2	1	0	
F8	The job becomes easier.	5	4	3	2	1	0	
F9	I just know it	5	4	3	2	1	0	
F10	My supervisor tells me.	5	4	3	2	1	0	
F11	Change in supervisor's attitude/behavior	5	4	3	2	1	0	
F12	Other [type of health worker] tell me.	5	4	3	2	1	0	
F13	The community members tell me	5	4	3	2	1	0	
F14	Change in the community beneficiaries knowledge, attitudes and behavior	5	4	3	2	1	0	
F15	The job becomes harder.	5	4	3	2	1	0	
F16	I just know it.	5	4	3	2	1	0	

**G. Time Commitment:** We want to understand how much time you spend on activities relating to your work.

G3d	How long do you USUALLY spend attending to <b>one</b> woman giving birth?	HOURS [ ][ ] MINUTES...[ ][ ]
G3e	How long do you USUALLY spend for <b>one</b> child-at-risk consultation for an HIV-exposed child?	HOURS [ ][ ] MINUTES...[ ][ ]
G4a	How many patients do you see in <b>a normal day</b> ?	[ ][ ]
G5	<b>In a month</b> , how many visits to the field do you make?	[ ][ ]
G6	In addition to birth consultations, administrative work and patient visits, how much time do you USUALLY spend doing other <i>[type of health worker]</i> related work in a month? (rephrased)	HOURS [ ][ ] MINUTES...[ ][ ]
In a normal week, how do these time commitments compare with the time you USUALLY spent on each of the following activities a year ago?		
G7a	First prenatal care visits	About the same.....1 More time spent (now).....2 Less time spent (now).....3
G7b	Follow-up prenatal care visits	About the same.....1 More time spent (now).....2 Less time spent (now).....3
G7c	Follow-up prenatal care visits with women living with HIV	About the same.....1 More time spent (now).....2 Less time spent (now).....3
G7d	Attending a woman giving birth	About the same.....1 More time spent (now).....2 Less time spent (now).....3
G7f	Child-at-risk consultation	About the same.....1 More time spent (now).....2 Less time spent (now).....3
G8	Other health related activities besides administrative work, consultations, and attending births	About the same.....1 More time spent (now).....2 Less time spent (now).....3
G9	Other personal activities	About the same.....1 More time spent (now).....2 Less time spent (now).....3

**SECTION I: Goal Setting:** We would like to know your views on the goals that you have for Começando Saudável, how these goals were set, and how these goals influence your work.

	<p>For each of the statements, please think about your goals for Começando Saudável and HOW STRONGLY each of the statements captures your view. Please tell me if you strongly agree, agree, agree somewhat, disagree, or strongly disagree.</p> <p>Again, please be reassured that all your responses are CONFIDENTIAL and no one from your work will have access this information.</p>						
		<b>Strongly Agree</b>	<b>Agree</b>	<b>Agree Somewhat</b>	<b>Disagree</b>	<b>Strongly Disagree</b>	<b>N/A</b>
I1	Myself and my colleagues have specific, clear goals to accomplish for Começando Saudável.	5	4	3	2	1	0
I2	The goals for Começando Saudável are reasonably challenging (not too easy, not too hard).	5	4	3	2	1	0
I3	We have deadlines for accomplishing the Começando Saudável goals.	5	4	3	2	1	0
I5	I understand the reasons behind the Começando Saudável goals.						
I6	My supervisor is supportive and respectful in encouraging us to reach the goals.	5	4	3	2	1	0
I7	I participated in the setting of the Começando Saudável goals.	5	4	3	2	1	0
I8	My supervisor lets us participate in deciding how to reach these goals.	5	4	3	2	1	0
I9	We receive recognition when we attain the Começando Saudável goals.	5	4	3	2	1	0
I10	I get discouraged if we are not making progress toward these goals.	5	4	3	2	1	0
I11	Trying for the Começando Saudável goals makes my work more engaging than it would be without these goals.	5	4	3	2	1	0
I12	I feel proud when we get feedback indicating that we have reached the Começando Saudável goals.	5	4	3	2	1	0
I13	My colleagues and I encourage each other to reach the Começando Saudável goals.	5	4	3	2	1	0
I14	I sometimes compete with my colleagues to see who can do the best in working towards the Começando Saudável goals.	5	4	3	2	1	0

I15	I usually feel that we have a suitable action plan for reaching these goals.	5	4	3	2	1	0
I16	I feel that my colleagues and I are prepared for and capable of reaching the Começando Saudável goals.	5	4	3	2	1	0
I17	I feel that factors outside my control influence whether we achieve the Começando Saudável goals or not.	5	4	3	2	1	0
I18	Having the Começando Saudável goals help me to do my job well.	5	4	3	2	1	0
I19	There is pressure to achieve the Começando Saudável goals.	5	4	3	2	1	0
I20	I am concerned that pressure to achieve the Começando Saudável goals can lead to cheating and dishonesty among other colleagues.	5	4	3	2	1	0
I21	I keep the Começando Saudável goals in mind while I am working.	5	4	3	2	1	0

**J. Incentives:** We would like to know your views on the individual and group financial incentives you receive.

<p>For each of the statements, please think about your experience during Começando Saudável and indicate HOW STRONGLY each of the statements captures your view. Please tell me if you strongly agree, agree, agree somewhat, disagree, or strongly disagree.</p> <p>Again, please be reassured that all your responses are CONFIDENTIAL and none of the supervisors will have access to your responses.</p>							
Nº		Strongly Agree	Agree	Agree Somewhat	Disagree	Strongly Disagree	N/A
J1	Our (association, health center) can improve our delivery of services when we receive the group incentive.	5	4	3	2	1	0
J2	I felt discouraged if our (association or health center) does not receive the maximum incentive.	5	4	3	2	1	0
J3	The incentives help our (association or health center) work together to achieve the goal.	5	4	3	2	1	0
J4	I feel that that the amount of the incentives for our (association or health center) is sufficient.	5	4	3	2	1	0

J5	The group incentives make some colleagues lazy because they know others will do more of the work.	5	4	3	2	1	0
J6	Structuring the incentives to go to our (association or health center) is a good approach compared to just receiving personal incentives.	5	4	3	2	1	0
J7	I feel that the group incentives encourage us in the (association or health center) to support each other.	5	4	3	2	1	0
J8	The group incentives make everyone in the group work equally hard.	5	4	3	2	1	0
J9	I feel that the maximum amount of the individual incentive is sufficient.	5	4	3	2	1	0
J10	I can attend more patients and achieve my goals if I receive the individual incentive.	5	4	3	2	1	0
J11	I feel recognized when I receive an individual incentive.	5	4	3	2	1	0



### N. Knowledge section

This is the last section of questions! These questions are to assess your knowledge about prevention of vertical transmission of HIV messages. Like the other sections, your answers will not be reported to anyone else.

(Interviewer: IF the [type of health worker] says they don't know the answer, CIRCLE 8". If the participant refuses to answer, circle 9. Do not present these to the participant as options.)

N1	Normally, how many times should a pregnant woman living with HIV on prophylaxis go to the health center for prenatal care?	One week after the first prenatal visit .....1 Once per month.....2 Depends on the status of the mother.....3 Other.....77 Don't know.....88 No Response.....99
N2	What type of prophylaxis is used in health centres in the periphery?	Monophylaxis (sdNVP).....1 Biprophylaxis (NVP, AZT).....2 Triprophylaxis (AZT, 3TC, NVP).....3 Other.....77 Don't know.....88 No Response.....99
N3	What happens if a woman forgets to take a dose of her HAART or prophylaxis during pregnancy?	Nothing .....1 Resistance to the medication.....2 The virus gets stronger.....3 The treatment becomes less effective.....4 There is a greater chance of the baby contracting the virus 5 Relapse (person gets sicker)..... 6 Other.....77 Don't know.....88 No Response.....99
N4	What should a woman do if she forgets to take a dose of her medication?	Take it as soon as she remembers.....1 Take it as soon as she remembers and adjust the time of the next dose.....2 Take two doses the next time.....3 If she remembers within two hours, take the dose. If not, begin with the next dose at the next scheduled time.....4 Wait for the next dose (regardless of when she remembers) ...5 Other: .....77 Don't know.....88 No Response .....99
N5	What is exclusive breastfeeding?	Only breastmilk .....1 Only breastmilk until 6 months.....2 Other.....77 Don't know.....88 No Response.....99
N6	At what age should a mother living with HIV start to introduce complementary foods (other foods that are not breastmilk) to her child?	..... months Other.....77 Don't know.....88 No Response.....99

N7	At what age should a mother living with HIV stop all breastfeeding?	<p>_____ months</p> <p>One year.....12</p> <p>Other.....77</p> <p>Don't know.....88</p> <p>No Response.....99</p>
N8	If the mother is on PVT prophylaxis, at what age should a breastfeeding child stop taking his prophylaxis?	<p>One week after stopping all breastfeeding.....1</p> <p>Other.....77</p> <p>Don't know.....88</p> <p>No Response.....99</p>
N9	If the mother is on HAART, at what age should a breastfeeding child stop taking his prophylaxis?	<p>6 weeks of age.....1</p> <p>Other.....77</p> <p>Don't know.....88</p> <p>No Response.....99</p>
N10	What are the services that a child exposed to HIV receive in child-at-risk consultations (CCR)?	<p>HIV testing.....1</p> <p>Refilling medications/prophylaxis for HIV .....2</p> <p>Monitoring the child's growth (weight).....3</p> <p>General child health.....4</p> <p>Advice/counseling.....5</p> <p>Nutrition monitoring.....6</p> <p>Other:.....77</p> <p>Don't know.....88</p> <p>Response.....99</p>
N11	Normally, how often should a child exposed to HIV go to the health center for a child-at-risk consultation?	<p>Once per month.....1</p> <p>Depends on the state of the child.....2</p> <p>Other:.....77</p> <p>Don't know.....88</p> <p>No Response .....99</p>
N12	At what ages should a child exposed to HIV be tested for HIV?	<p>One month .....1</p> <p>9 months.....2</p> <p>18 months.....3</p> <p>9-18 months.....4</p> <p>2 months after stopping breastfeeding.....5</p> <p>Other.....77</p> <p>Don't know.....88</p> <p>No Response.....99</p>

N13	The following questions are about Option B+. Have you had training on option B+?	No.....1 Yes.....2  <b>Is No, say: I understand that you haven't had training on B+. However, you may know the answers to these questions.</b>
N14	What are the tests that should be done for a pregnant woman living with HIV who is starting HAART?  <i>Sonde varias vezes, para extrair todas as respostas corretas- "mais uma maneira?"</i>  <i>Se falar "ir a unidade sanitária", sonde QUANDO/PARA QUE</i>	CD4.....1 Malaria test.....2 Syphilis test.....3 Tuberculosis test.....4 Renal functioning.....5 Biochemical panel.....6 Hemograma.....7 Other.....77 Don't know.....88 No Response.....99
N15	What are the componentes of the medicine regimen for HAART being used with pregnant women living with HIV?	<b>Duovir [Zidovudina (AZT) + Lamivudina (3TC)] + Efavirenz (EFV) .....1</b> <b>Tenofovir (TDF) + Lamiduvina (3TC) + Efavirenz (EFV) .....2</b> <b>Duovir [Zidovudina (AZT) + Lamivudina (3TC)] + Neverapina (NVP) .....3</b> Other.....77 Don't know.....88 No Response.....99
N16	What circumstance is necessary for a pregnant woman living with HIV to initiate TARV on her first visit?	She is psychologically prepared.....1 Other.....77 Don't know.....88 No Response.....99
N17	How many days of HAART medicines does a woman living with HIV receive for her first month, even if she will return for a follow-up visit in 7-14 days?	30 days.....1 _____ days Other.....77 Don't know.....88 No Response.....99

**Thank you very much once again for your time, and for giving us this information.**

#### NOTES

*Description of interview:*

*Participant attitude:*

*Location:*

## APPENDIX E

### Exit interview guide

#### Começando Saudável Exit Interview Guide – District and Health Centers

*Thank you for taking time to talk to us today. The reason why we are interested in talking with you is because you are a (district official, health worker). This means you have very valuable experience interacting with the health system and how it operates. This is not a test; this is to really learn from you, the expert in this situation.*

*Our purpose today in talking with you is to learn about your experiences with Começando Saudável. We want to find out if this performance-based incentive program with the district, including health centers and activista associations, is worth trying in other places or at a larger scale, and so we really need to learn from you. You should know that the things you tell us here will remain confidential; we will not share information you give us with your colleagues or supervisors in a way that you will be able to be identified.*

Time Started: \_\_\_\_\_ Time Completed: \_\_\_\_\_

A1. Gender: \_\_\_\_\_

A2. Age: \_\_\_\_\_ years

A3. Title of your position: \_\_\_\_\_

A4. Length of time working in this position: \_\_\_\_\_

A5a: Did you hold a related position before? \_\_\_\_\_

A5b: If so, what was it? \_\_\_\_\_

A5c. How long did you work in that other position? \_\_\_\_\_

1. Please describe what you understand Começando Saudável, the PBF program, to be.

N.B. Correct any misunderstandings so that the following questions are actually asking about Começando Saudável

2. Please describe your role in Começando Saudável.

3.0 Think about the state of the health system (health center) at the time Começando Saudável was being developed and implemented (June-August 2013).

Please describe your experiences of the process of developing the PBF model.

3.1 Probes: What do you remember about deciding on the indicators, setting the goals for the indicators, group-level goals, designing quarterly evaluations, type of incentives, how funds would be dispersed).

3.2 What worked well in developing Começando Saudável?

3.3 What were some challenges that you experienced?

3.4 In other places, stakeholders have faced constraints when developing a program, such as feeling comfortable speaking their mind. Did you encounter any such problems?

3.5 What would you or your colleagues do differently when developing such a program in the future?

4.0 Do you think Começando Saudável was well understood by health workers?

4.1 Did the Começando Saudável affect the attitude of health workers? How?

5.0 How do you and your colleagues feel about the process of how the performance of you and your colleagues was evaluated(to see if goals were met)?

5.1 What was your opinion of the performance goals? Did you think the goals were reasonable? Do you wish they were somehow different? How?

5.2 How do you think having goals for the entire group (health center) worked?

Probes: Any positive effect? Which ones? Any negative effect? Which ones? Did it help workers collaborate towards the goal?

5.3 How do you feel the quarterly evaluation of performance went?

5.4 What would you recommend to improve the evaluation of achievement of the goals?

6.0 Were there any external factors that affected the performance of your (district, health center) for any of the quarterly evaluations?

6.1 What were they? Probes: Transition from Mais Vida to CCS as HIV prevention and treatment partner in the district. Major stock-outs of medicine. Turn-over of staff.

Tensions among staff. When?

6.2 In light of these, do you have any recommendations for how Começando Saudável could/should have responded? How?

7.0 Please describe how you decided how funds would be used.

7.1 How do you feel that this process went? What would you recommend to improve this? How?

8.0 Please describe the process for receiving funds earned.

8.1 How do you feel that this process went?

8.2 What would you recommend to improve this?

8.3 We heard that there were challenges in disbursement of funds; that funds for the health center had to be transferred into the personal account of health center workers. How do you feel about that? (Any concerns with transparency?)

9. Do you think that having these goals motivated your colleagues to do their job better? Worse? Do you think that receiving incentives motivated your colleagues to do their job better? Please explain.

9.1 Were the incentives appropriate to motivate health workers? Why or why not?

9.2 In your opinion, how did it work to have the payment of the individual incentives depend on attaining the group goals and receiving the group incentives?

10.0 Did Começando Saudável affect the overall delivery of maternal and child health and prevention of vertical transmission services in your district? How?

10.1 Do you think it helped increase community contacts of patients? How?

10.2 Do you think it affected retaining women and child in care at the health centers? How?

11.0 What relationship do activists have with the district? Does it vary by health center? What makes it work well in health centres where activists have strong linkages?

11.1 Activistas also are part of Começando Saudável, and they have goals to increase number of home visits with pregnant women who living with HIV and with children exposed to HIV. Have you noticed an change in number of patients coming for PVT services due to activista involvement?

- 11.2 Have you noticed a change in collaboration among health centres and associations due to Comencando Saudável?
- 12.0 How did the PBF affect your (district, health center)?
- 12.1 What were some positive effects? Probes: Facilitate the (district's, health center's) autonomy to prioritize funds? More resources? Changes in supervision? Collaboration among sectors?
- 12.2 What were some negative effects? Probes: In other PBF programs, people have reported prioritizing work to meet the PBF goals at expense of other work duties and falsifying reports. Have you or your colleagues heard of anything like this happening in your (district, health center)?
- 13.0 Comencando Saudável is conducting our evaluation, and it looks like using performance-based incentives did not have an effect on our indicators (number of PTV services delivered). Why do you think this happened, that the program was not successful?
- 14.0 How would you describe the relationship between the district and health centers and between Sede and the periphery? Any challenges?
- 14.1 Probe: During Comencando Saudável, we observed challenges in communication and processes between district and health centers and between Sede and peripheral health centers in terms of ordering and distribution of supplies. Did you see anything like this?
- 14.2 How do you think this affected the PBF initiative?
- 14.3 Do you think other systemic issues need to be sorted out before trying a new PBF initiative? Like what?
15. What advice do you have for another district (health center) considering implementing a PBF?

**For Comparison District only:**

16. How do you feel about being the control district for Comencando Saudável?

*Thank-you for sharing your time and this helpful information.*

Descriptions of interview:

## REFERENCES

- Agadjanian, V., & Hayford, S. R. (2009). PMTCT, HAART, and Childbearing in Mozambique: An Institutional Perspective. *AIDS and Behavior*, 13(S1), 103–112. <http://doi.org/10.1007/s10461-009-9535-0>
- Ahmed, S., Kim, M. H., Dave, A. C., Sabelli, R., Kanjelo, K., Preidis, G. A., et al. (2015). Improved identification and enrolment into care of HIV-exposed and -infected infants and children following a community health worker intervention in Lilongwe, Malawi. *Journal of the International AIDS Society*, 18(1). <http://doi.org/10.7448/IAS.18.1.19305>
- Asefa, A., & Mitike, G. (2014). Prevention of Mother-to-Child Transmission (PMTCT) of HIV services in Adama town, Ethiopia: clients' satisfaction and challenges experienced by service providers. *BMC Pregnancy and Childbirth*, 14, 57. <http://doi.org/10.1186/1471-2393-14-57>
- Ashir, G. M., Doctor, H. V., & Afenyadu, G. Y. (2013). Performance based financing and uptake of maternal and child health services in Yobe State, northern Nigeria. *Global Journal of Health Science*, 5(3), 34–41. <http://doi.org/10.5539/gjhs.v5n3p34>
- Audet, C. M., Burlison, J., Moon, T. D., Sidat, M., Vergara, A. E., & Vermund, S. H. (2010). Sociocultural and epidemiological aspects of HIV/AIDS in Mozambique. *BMC International Health and Human Rights*, 10(1), 15. <http://doi.org/10.1186/1472-698X-10-15>
- Audet, C. M., Salato, J., Blevins, M., Amsalem, D., Vermund, S. H., & Gaspar, F. (2013). Educational intervention increased referrals to allopathic care by traditional healers in three high HIV-prevalence rural districts in Mozambique. *PLoS ONE*, 8(8), e70326. <http://doi.org/10.1371/journal.pone.0070326.t004>
- Basinga, P., Gertler, P. J., Binagwaho, A., Soucat, A. L., Sturdy, J., & Vermeersch, C. M. (2011). Effect on maternal and child health services in Rwanda of payment to primary health-care providers for performance: an impact evaluation. *The Lancet*, 377(9775), 1421–1428. [http://doi.org/10.1016/S0140-6736\(11\)60177-3](http://doi.org/10.1016/S0140-6736(11)60177-3)
- Baxter, J., & Eyles, J. (1997). Evaluating qualitative research in social geography: establishing “rigour” in interview analysis. *Transactions of the Institute of British Geographers*, 22(4), 505–525. <http://doi.org/10.1111/j.0020-2754.1997.00505.x>
- Beith, Alexandra, Eichler, R., & Weil, D. (2007). *Performance-based incentives for health: Tuberculosis detection* (No. 122) (pp. 1–32). Center for Global Development.
- Bernard, H. R. (2012). Participant observation. In *Social Research Methods* (pp. 309–343). Los Angeles : SAGE.
- Binyaruka, P., Patouillard, E., Powell-Jackson, T., Greco, G., Maestad, O., & Borghi, J. (2015). Effect of paying for performance on utilisation, quality, and user costs of health services in Tanzania: a controlled before and after study. *PLoS ONE*, 10(8), e0135013–16. <http://doi.org/10.1371/journal.pone.0135013>
- Blaauw, D., Ditlopo, P., Maseko, F., Chirwa, M., Mwisongo, A., Bidwell, P., et al. (2013). Comparing the job satisfaction and intention to leave of different categories of health workers in Tanzania, Malawi, and South Africa. *Global Health Action*, 6, 19287.
- Blumberg, M., & Pringle, C. D. (1982). The Missing Opportunity in Organizational Research: Some Implications for a Theory of Work Performance. *Academy of Management Review*, 7(4), 560–569. <http://doi.org/10.5465/AMR.1982.4285240>
- Bonfrer, I., Soeters, R., Van de Poel, E., Basenya, O., Longin, G., van de Looij, F., & van Doorslaer, E. (2014). Introduction of performance-based financing in Burundi was associated with improvements in care and quality. *Health Affairs (Project Hope)*, 33(12), 2179–2187. <http://doi.org/10.1377/hlthaff.2014.0081>
- Boudreau, J. W., Hopp, W., McClain, J. O., & Thomas, L. J. (2002). *On the interface between operations and human resources management* (No. CAHRS Working Paper #02-22) (pp. 1–41). Ithaca, NY: Cornell University, School of Industrial and Labor Relations, Center for Advanced Human Resource Studies.

- Buskens, I., & Jaffe, A. (2008). Demotivating infant feeding counseling encounters in southern Africa: do counselors need more or different training? *AIDS Care*, 20(3), 337–345. <http://doi.org/10.1080/09540120701660346>
- Bwirire, L. D., Fitzgerald, M., Zachariah, R., Chikafa, V., Massaquoi, M., Moens, M., et al. (2008). Reasons for loss to follow-up among mothers registered in a prevention-of-mother-to-child transmission program in rural Malawi. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 102(12), 1195–1200.
- Byrne, A., & Morgan, A. (2011). How the integration of traditional birth attendants with formal health systems can increase skilled birth attendance. *International Journal of Gynecology & Obstetrics*, 115(2), 127–134. <http://doi.org/10.1016/j.ijgo.2011.06.019>
- Callaghan, M., Ford, N., & Schneider, H. (2010). A systematic review of task-shifting for HIV treatment and care in Africa. *Human Resources for Health*, 8, 8. <http://doi.org/10.1186/1478-4491-8-8>
- Calvert, C., & Ronsmans, C. (2013). The contribution of HIV to pregnancy-related mortality: A systematic review and meta-analysis. *Aids*, 27(10), 1631–1639.
- CARE. (2012). Monitoring and evaluation of prevention of vertical transmission of HIV services in Inhambane, Mozambique.
- Chasela, C. S., Hudgens, M. G., Jamieson, D. J., Kayira, D., Hosseinipour, M. C., Kourtis, A. P., et al. (2010). Maternal or infant antiretroviral drugs to reduce HIV-1 transmission. *New England Journal of Medicine*, 362(24), 2271–2281. <http://doi.org/10.1056/NEJMoa0911486>
- Chi, B. H., Stringer, J. S. A., & Moodley, D. (2013). Antiretroviral drug regimens to prevent mother-to-child transmission of HIV: a review of scientific, program, and policy advances for Sub-Saharan Africa. *Current HIV/AIDS Reports*, 10(2), 124–133. <http://doi.org/10.1007/s11904-013-0154-z>
- Chimhutu, V., Lindkvist, I., & Lange, S. (2014). When incentives work too well: locally implemented pay for performance (P4P) and adverse sanctions towards home birth in Tanzania - a qualitative study. *BMC Health Services Research*, 14(1), 1. <http://doi.org/10.1186/1472-6963-14-23>
- Chinkonde, J. R., Sundby, J., de Paoli, M., & Thorsen, V. C. (2010). The difficulty with responding to policy changes for HIV and infant feeding in Malawi. *International Breastfeeding Journal*, 5(1), 11. <http://doi.org/10.1186/1746-4358-5-11>
- Chivonivoni, C., Ehlers, V. J., & Roos, J. H. (2008). Mothers' attitudes towards using services preventing mother-to-child HIV/AIDS transmission in Zimbabwe: An interview survey. *International Journal of Nursing Studies*, 45(11), 1618–1624.
- Chopra, M., & Rollins, N. (2008). Infant feeding in the time of HIV: rapid assessment of infant feeding policy and programmes in four African countries scaling up prevention of mother to child transmission programmes. *Archives of Disease in Childhood*, 93(4), 288–291. <http://doi.org/10.1136/adc.2006.096321>
- Chopra, M., Sharkey, A., Dalmiya, N., Anthony, D., & Binkin, N. (2012). Strategies to improve health coverage and narrow the equity gap in child survival, health, and nutrition. *The Lancet*, 380(9850), 1331–1340.
- CNCS. (2012). *Global AIDS Response Progress Report: Mozambique for the period 2010-2011* (pp. 1–169).
- CNCS. (2014). *Global AIDS response progress report: Mozambique* (pp. 1–123). Maputo: Conselho Nacional de Combate ao HIV e SIDA and UNAIDS.
- Condo, J., Mugeni, C., Naughton, B., Hall, K., Tuazon, M., Omwega, A., et al. (2014). Rwanda's evolving community health worker system: a qualitative assessment of client and provider perspectives. *Human Resources for Health*, 12(1), 71–7. <http://doi.org/10.1186/1478-4491-12-71>
- Connor, C., Cumbi, A., Borem, P., Beith, A., Eichler, R., & Charles, J. (2011). *Performance-based incentives in Mozambique: a situational analysis* (Vol. 20, pp. 1–77). Bethesda, MD: Abt Associates.
- Corgnet, B., Gómez-Miñambres, J., & Hernán-González, R. (2015). Goal setting and monetary incentives: when large stakes are not enough. *Management Science*, 61(12), 2926–2944. <http://doi.org/10.1287/mnsc.2014.2068>



- Creek, T., Ntumy, R., Mazhani, L., Moore, J., Smith, M., Han, G., et al. (2009). Factors associated with low early uptake of a national program to prevent mother to child transmission of HIV (PMTCT): results of a survey of mothers and providers, Botswana, 2003. *AIDS and Behavior*, 13(2), 356–364. <http://doi.org/10.1007/s10461-007-9322-8>
- de Paoli, M. M., Manongi, R., & Klepp, K.-I. (2002). Counselors' perspectives on antenatal HIV testing and infant feeding dilemmas facing women with HIV in northern Tanzania. *Reproductive Health Matters*, 10(20), 144–156.
- de Walque, D., Gertler, P. J., & Bautista-Arredondo, S. (2013). *Using provider performance incentives to increase HIV testing and counseling services in Rwanda* (No. Policy Research Working Paper 6364). The World Bank.
- de Walque, D., Gertler, P. J., Bautista-Arredondo, S., Kwan, A., Vermeersch, C., de Dieu Bizimana, J., et al. (2015). Using provider performance incentives to increase HIV testing and counseling services in Rwanda. *Journal of Health Economics*, 40, 1–9. <http://doi.org/10.1016/j.jhealeco.2014.12.001>
- Delva, W., Draper, B., & Temmerman, M. (2006). Implementation of single-dose nevirapine for prevention of MTCT of HIV -lessons from Cape Town. *Southern African Medical Journal*, 96(8), 706–708–9.
- Dickin, K. L., Dollahite, J. S., & Habicht, J. P. (2010). Job Satisfaction and Retention of Community Nutrition Educators: The Importance of Perceived Value of the Program, Consultative Supervision, and Work Relationships. *Journal of Nutrition Education and Behavior*, 42(5), 337–344. <http://doi.org/10.1016/j.jneb.2009.08.008>
- Doherty, T. M., McCoy, D., & Donohue, S. (2005). Health system constraints to optimal coverage of the prevention of mother-to-child HIV transmission programme in South Africa: lessons from the implementation of the national pilot programme. *African Health Sciences*, 5(3), 213–218. <http://doi.org/10.5555/afhs.2005.5.3.213>
- Doherty, T., Chopra, M., Nsiband, D., & Mngoma, D. (2009). Improving the coverage of the PMTCT programme through a participatory quality improvement intervention in South Africa. *BMC Public Health*, 9(1), 406. <http://doi.org/10.1186/1471-2458-9-406>
- Donahue, M. C., Dube, Q., Dow, A., Umar, E., & Van Rie, A. (2012). “They Have Already Thrown Away Their Chicken”: Barriers affecting participation by HIV-infected women in care and treatment programs for their infants in Blantyre, Malawi. *AIDS Care*, 24(10), 1233–1239.
- Dynes, M., Buffington, S. T., Carpenter, M., Handley, A., Kelley, M., Tadesse, L., et al. (2013). Strengthening maternal and newborn health in rural Ethiopia: Early results from frontline health worker community maternal and newborn health training. *Midwifery*, 29(3), 251–259.
- Edwards, N., & Barker, P. M. (2014). The importance of context in implementation research. *Journal of Acquired Immune Deficiency Syndromes*, 67 Suppl 2, S157–62. <http://doi.org/10.1097/QAI.0000000000000322>
- Eichler, R., Agarwal, K., Askew, I., & Iriarte, E. (2013). Performance-based incentives to improve health status of mothers and newborns: what does the evidence show? *Journal of Health, Population, and Nutrition*, 11(4 (Suppl 2)), 36–47. <http://doi.org/10.1186/1479-5868-11-63>
- Fadnes, L. T., Engebretsen, I., Moland, K., Nankunda, J., Tumwine, J. K., & Tylleskär, T. (2010). Infant feeding counseling in Uganda in a changing environment with focus on the general population and HIV-positive mothers - a mixed method approach. *BMC Health Services Research*, 10, 260. <http://doi.org/10.1186/1472-6963-10-260>
- Falisse, J.-B., Meessen, B., Ndayishimiye, J., & Bossuyt, M. (2012). Community participation and voice mechanisms under performance-based financing schemes in Burundi. *Tropical Medicine & International Health*, 17(5), 674–682.
- Falnes, E. F., Tylleskär, T., de Paoli, M. M., Manongi, R., & Engebretsen, I. M. (2010). Mothers' knowledge and utilization of prevention of mother to child transmission services in northern Tanzania. *Journal of the International AIDS Society*, 13(1), 1. <http://doi.org/10.1186/1758-2652-13-36>
- Fawzy, A., Arpadi, S., Kankasa, C., Sinkala, M., Mwiya, M., Thea, D. M., et al. (2011). Early weaning

- increases diarrhea morbidity and mortality among uninfected children born to HIV-infected mothers in Zambia. *Journal of Infectious Diseases*, 203(9), 1222–1230.
- Fox, S., Witter, S., Wylde, E., Mafuta, E., & Lievens, T. (2013). Paying health workers for performance in a fragmented, fragile state: reflections from Katanga Province, Democratic Republic of Congo. *Health Policy and Planning*. <http://doi.org/10.1093/heapol/czs138>
- Franco, L. M., Bennett, S., & Kanfer, R. (2002). Health sector reform and public sector health worker motivation: a conceptual framework. *Social Science & Medicine* (1982), 54(8), 1255–1266. [http://doi.org/10.1016/S0277-9536\(01\)00094-6](http://doi.org/10.1016/S0277-9536(01)00094-6)
- Fretheim, A., Witter, S., & Lindahl, A. K. (2012). Performance-based financing in low-and middle-income countries: Still more questions than answers. *Bulletin of the World Health Organization*, 90, 559–559A.
- Friedman, K. (2003). Theory construction in design research: criteria: approaches, and methods. *Design Studies*, 24(6), 507–522. [http://doi.org/10.1016/S0142-694X\(03\)00039-5](http://doi.org/10.1016/S0142-694X(03)00039-5)
- Geelhoed, D., Lafort, Y., Chissale, É., Candrinho, B., & Degomme, O. (2013a). Integrated maternal and child health services in Mozambique: structural health system limitations overshadow its effect on follow-up of HIV-exposed infants. *BMC Health Services Research*, 13(1), 207. <http://doi.org/10.1371/journal.pone.0035268>
- Geelhoed, D., Lafort, Y., Chissale, L., Candrinho, B., & Degomme, O. (2013b). Integrated maternal and child health services in Mozambique: structural health system limitations overshadow its effect on follow-up of HIV-exposed infants. *BMC Health Services Research*, 13, 207. <http://doi.org/10.1186/1472-6963-13-207>
- Ghanotakis, E., & Attiah, J. (2010). *Performance-based financing: A promising strategy to improve HIV service delivery* (pp. 1–13). Elisabeth Glaser Pediatric AIDS Foundation.
- Glenton, C., Scheel, I. B., Pradhan, S., Lewin, S., Hodgins, S., & Shrestha, V. (2010). The female community health volunteer programme in Nepal: Decision makers' perceptions of volunteerism, payment and other incentives. *Social Science & Medicine*, 70(12), 1920–1927.
- Global Health Workforce Alliance, WHO. (2014). *A universal truth: no health without a workforce* (pp. 1–104). Geneva: World Health Organization.
- Gourlay, A., Birdthistle, I., Mburu, G., Iorpenda, K., & Wringe, A. (2013). Barriers and facilitating factors to the uptake of antiretroviral drugs for prevention of mother-to-child transmission of HIV in sub-Saharan Africa: a systematic review. *Journal of the International AIDS Society*, 16(1). <http://doi.org/10.7448/IAS.16.1.18588>
- Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods*, 18(1), 59–82. <http://doi.org/10.1177/1525822X05279903>
- Hamela, G., Kabondo, C., Tembo, T., Zimba, C., Kamanga, E., Mofolo, I., et al. (2014). Evaluating the benefits of incorporating traditional birth attendants in HIV prevention of mother to child transmission service delivery in Lilongwe, Malawi. *African Journal of Reproductive Health*, 18(1), 27–34.
- Hardon, A., Vernooij, E., Bongololo-Mbera, G., Cherutich, P., Desclaux, A., Kyaddondo, D., et al. (2012). Women's views on consent, counseling and confidentiality in PMTCT: A mixed-methods study in four African countries. *BMC Public Health*, 12(1), 26.
- Heiby, J. (2014). The use of modern quality improvement approaches to strengthen African health systems: a 5-year agenda. *International Journal for Quality in Health Care*, 26(2), 117–123. <http://doi.org/10.1093/intqhc/mzt093>
- hlarlath, M. O., Grede, N., de Pee, S., & Bloem, M. (2014). Economic and social factors are some of the most common barriers preventing women from accessing maternal and newborn child health (MNCH) and prevention of mother-to-child transmission (PMTCT) services: a literature review. *AIDS and Behavior*, 18 Suppl 5, S516–30. <http://doi.org/10.1007/s10461-014-0756-5>
- Horwood, C., Haskins, L., & Vermaak, K. (2010a). Prevention of mother to child transmission of HIV (PMTCT) programme in KwaZulu-Natal, South Africa: an evaluation of PMTCT implementation and integration into routine maternal, child and women's health services. *Tropical Medicine &*

- International Health*, 992–999. <http://doi.org/10.1111/j.1365-3156.2010.02576.x>
- Horwood, C., Voce, A., Vermaak, K., Rollins, N., & Qazi, S. (2010b). Routine checks for hiv in children attending primary health care facilities in South Africa: attitudes of nurses and child caregivers. *Social Science & Medicine*, 70(2), 313–320. <http://doi.org/10.1016/j.socscimed.2009.10.002>
- Human Development Report Office. (2013). *Statistical Annex for the Human Development Report 2013: The Rise of the South* (pp. 139–203). United Nations Development Programme.
- Ireland, M., Paul, E., & Dujardin, B. (2011). Can performance-based financing be used to reform health systems in developing countries? *Bulletin of the World Health Organization*, 89(9), 695–698. <http://doi.org/10.2471/BLT.11.087379>
- Israel-Ballard, K., Waithaka, M., & Greiner, T. (2014). Infant feeding counseling of HIV-infected women in two areas in Kenya in 2008. *International Journal of STD & AIDS*, 25(13), 921–928. <http://doi.org/10.1177/0956462414526574>
- Jahn, A., Paul, F., & Beiersmann, C. (2013). *Peer Review: Results-based financing of maternal and newborn health care in low and lower-middle income countries* (pp. 1–22). Heidelberg.
- Janssen, W., de Dieu Ndirabeya, J., Matungwa, M., & Van Bastelaere, S. (2015). Improving quality through performance-based financing in district hospitals in Rwanda between 2006 and 2010: A 5-year experience. *Tropical Doctor*, 45(1), 27–35. <http://doi.org/10.1177/0049475514554481>
- Kalipeni, E., Semu, L. L., & Mbilizi, M. A. (2012). The brain drain of health care professionals from sub-Saharan Africa: a geographic perspective. *Progress in Development Studies*, 12(2-3), 153–171. <http://doi.org/10.1177/146499341101200305>
- Kallander, K., Strachan, D., Soremekun, S., Hill, Z., Lingam, R., Tibenderana, J., et al. (2015). Evaluating the effect of innovative motivation and supervision approaches on community health worker performance and retention in Uganda and Mozambique: study protocol for a randomised controlled trial. *Trials*, 16(1), 157. <http://doi.org/10.1186/s13063-015-0657-6>
- Kalofonos, I. (2014). Global Public Health: An International Journal for Research, Policy and Practice. *Global Public Health*, 9(1–2), 7–24. <http://doi.org/10.1080/17441692.2014.881527>
- Kambarami, R. A., Mbuya, M. N. N., Pelletier, D., Fundira, D., Tavengwa, N. V., & Stoltzfus, R. (2016). Factors associated with village health worker performance differ by task in a multi-tasked setting in rural Zimbabwe. *Global Health Science Practice*, In Press.
- Keugoung, B., Ymele, F. F., Fotsing, R., Macq, J., Meli, J., & Criel, B. (2014). A systematic review of missed opportunities for improving tuberculosis and HIV/AIDS control in sub-Saharan Africa: what is still missed by health experts? *Pan African Medical Journal*, 18, 1–11. <http://doi.org/10.11604/pamj.2014.18.320.4066>
- Kim, Y. M., Banda, J., Hiner, C., Tholandi, M., Bazant, E., Sarkar, S., et al. (2013). Assessing the quality of HIV/AIDS services at military health facilities in Zambia. *International Journal of STD & AIDS*, 24(5), 365–370. <http://doi.org/10.1177/0956462412472811>
- Kok, M. C., Dieleman, M., Taegtmeyer, M., Broerse, J. E., Kane, S. S., Ormel, H., et al. (2014). Which intervention design factors influence performance of community health workers in low- and middle-income countries? A systematic review. *Health Policy and Planning*, Advance online publication. <http://doi.org/10.1093/heapol/czu126>
- Kruk, M. E., Wladis, A., Mbembati, N., Ndao-Brumblay, S. K., Hsia, R. Y., Galukande, M., et al. (2010). Human resource and funding constraints for essential surgery in district hospitals in Africa: a retrospective cross-sectional survey. *PLoS Medicine*, 7(3), e1000242. <http://doi.org/10.1371/journal.pmed.1000242>
- Kwapong, G. D., Boateng, D., Agyei-Baffour, P., & Addy, E. A. (2014). Health service barriers to HIV testing and counseling among pregnant women attending antenatal clinic; a cross-sectional study. *BMC Health Services Research*, 14, 267. <http://doi.org/10.1186/1472-6963-14-267>
- Labhardt, N. D., Manga, E., Ndam, M., Balo, J.-R., Bischoff, A., & Stoll, B. (2009). Early assessment of the implementation of a national programme for the prevention of mother-to-child transmission of HIV in Cameroon and the effects of staff training: a survey in 70 rural health care facilities. *Tropical Medicine & International Health*, 14(3), 288–293. <http://doi.org/10.1111/j.1365-3156.2009.02221.x>

- Laher, F., Cescon, A., Lazarus, E., Kaida, A., Makongoza, M., Hogg, R. S., et al. (2012). Conversations with mothers: exploring reasons for prevention of mother-to-child transmission (PMTCT) failures in the era of programmatic scale-up in Soweto, South Africa. *AIDS and Behavior*, 16(1), 91–98.
- le Roux, I. M., Tomlinson, M., Harwood, J. M., O'Connor, M. J., Worthman, C. M., Mbewu, N., et al. (2013). Outcomes of home visits for pregnant township mothers and their infants in South Africa: A cluster randomised controlled trial. *Aids*.
- Ledikwe, J. H., Kejelepula, M., Maupo, K., Sebetso, S., Thekiso, M., Smith, M., et al. (2013). Evaluation of a well-established task-shifting initiative: the lay counselor cadre in Botswana. *PLoS ONE*, 8(4), e61601. <http://doi.org/10.1371/journal.pone.0061601>
- Leshabari, S. C., Blystad, A., de Paoli, M., & Moland, K. M. (2007). HIV and infant feeding counseling: challenges faced by nurse-counselors in northern Tanzania. *Human Resources for Health*, 5, 18.
- Levy, J. M. (2009). Women's expectations of treatment and care after an antenatal HIV diagnosis in Lilongwe, Malawi. *Reproductive Health Matters*, 17(33), 152–161. [http://doi.org/10.1016/S0968-8080\(09\)33436-9](http://doi.org/10.1016/S0968-8080(09)33436-9)
- Lilian, R. R., Kalk, E., Technau, K.-G., & Sherman, G. G. (2013). Birth diagnosis of HIV infection on infants to reduce infant mortality and monitor for elimination of mother-to-child transmission. *Pediatrics Infectious Disease Journal*, 32(10), 1080–1085.
- Lippmann, Q. K., Mofolo, I., Bobrow, E., Maida, A., Kamanga, E., Pagadala, N., et al. (2012). Exploring the feasibility of engaging traditional birth attendants in a prevention of mother to child HIV transmission program in Lilongwe, Malawi. *Malawi Medical Journal*, 24(4), 79–80.
- Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: a 35-year odyssey. *American Psychologist*, 57(9), 705–717. <http://doi.org/10.1037/0003-066X.57.9.705>
- Maes, K. C., Kohrt, B. A., & Closser, S. (2010). Culture, status and context in community health worker pay: Pitfalls and opportunities for policy research. A commentary on Glenton et al. (2010). *Social Science & Medicine* (1982), 71(8), 1375–1378.
- Magrath, P., & Nichter, M. (2012). Paying for performance and the social relations of health care provision: an anthropological perspective. *Social Science & Medicine*, 75(10), 1778–1785. <http://doi.org/10.1016/j.socscimed.2012.07.025>
- Malema, R. N., Malaka, D. W., & Mothiba, T. M. (2010). Experiences of lay counselors who provide VCT for PMTCT of HIV and AIDS in the Capricorn District, Limpopo Province. *Curationis*, 33(3), 15–23.
- Marazzi, M. C., Palombi, L., Nielsen-Saines, K., Haswell, J., Zimba, I., Magid, N. A., et al. (2011). Extended antenatal use of triple antiretroviral therapy for prevention of mother-to-child transmission of HIV-1 correlates with favorable pregnancy outcomes. *Aids*, 25(13), 1611–1618. <http://doi.org/10.1097/QAD.0b013e3283493ed0>
- Mathauer, I., & Imhoff, I. (2006). Health worker motivation in Africa: The role of non-financial incentives and human resource management tools. *Human Resources for Health*, 4(1), 24.
- Mazia, G., Narayanan, I., Warren, C., Mahdi, M., Chibuye, P., Walligo, A., et al. (2009). Integrating quality postnatal care into PMTCT in Swaziland. *Global Public Health*, 4(3), 253–270. <http://doi.org/10.1080/17441690902769669>
- Mbaruku, G. M., Larson, E., Kimweri, A., & Kruk, M. E. (2014). What elements of the work environment are most responsible for health worker dissatisfaction in rural primary care clinics in Tanzania? *Human Resources for Health*, 12(1), 1–9. <http://doi.org/10.1186/1478-4491-12-38>
- Mbilinyi, D., Daniel, M. L., & Lie, G. T. (2011). Health worker motivation in the context of HIV care and treatment challenges in Mbeya Region, Tanzania: A qualitative study. *BMC Health Services Research*, 11, 266.
- Mbindyo, P. M., Blaauw, D., Gilson, L., & English, M. (2009). Developing a tool to measure health worker motivation in district hospitals in Kenya. *Human Resources for Health*, 7(1), 40.
- Mbuya, M. (2008, May 13). *Exploring the role of community health workers and their perceived work context on the delivery of behavior change communication in rural Haiti*. (J.-P. Habicht, Ed.).

Cornell University.

- Medley, A. M., & Kennedy, C. E. (2010). Provider challenges in implementing antenatal provider-initiated HIV testing and counseling programs in Uganda. *AIDS Education and Prevention*, 22(2), 87–99. <http://doi.org/10.1521/aeap.2010.22.2.87>
- Meessen, B., Soucat, A., & Sekabaraga, C. (2011). Performance-based financing: just a donor fad or a catalyst towards comprehensive health-care reform? *Bulletin of the World Health Organization*, 89(2), 153–156. <http://doi.org/10.2471/BLT.10.077339>
- Menon, P., Mbuya, M., Habicht, J. P., Peltó, G., Loechl, C. U., & Ruel, M. T. (2008). Assessing supervisory and motivational factors in the context of a program evaluation in rural Haiti. *Journal of Nutrition*, 138(3), 634–637.
- Ministry of Health. (2009). *Strategy for strengthening interventions with traditional midwives* (pp. 1–29). Republica de Mocambique.
- Ministry of Health. (2010). *Programa de Revitalização dos Agentes Polivalentes Elementares* (pp. 1–37). República de Moçambique.
- Ministry of Health of Mozambique. (2013). *Mozambique demographic and health survey 2011* (pp. 1–430). Calverton, MD, USA: National Institute of Statistics of Mozambique and ICF International.
- Ministry of Health. (2012). Plan for the year 2012: target group and district goal. Republic of Mozambique.
- Mnyani, C. N., & McIntyre, J. A. (2013). Challenges to delivering quality care in a prevention of mother-to-child transmission of HIV programme in Soweto. *Southern African Journal of HIV Medicine*, 14(2), 64–69. <http://doi.org/10.4102/hivmed.v14i2.80>
- Morgan, L., & Eichler, R. (2011). *Performance-based incentives in Africa: experiences, challenges, lessons* (pp. 1–77). Bethesda, MD: Health Systems 2020, Abt Associates Inc.
- Morgan, L., Beith, A., & Eichler, R. (2011). *Performance-based incentives for maternal health: Taking stock of current programs and future potentials* (pp. 1–61). Bethesda, MD: Health Systems 2020, Abt Associates Inc.
- Mugeni, C., Ngabo, F., & Humuza, J. (2011). *Community performance-based financing in health: Incentivizing mothers and community-health workers to improve maternal health outcomes in Rwanda* (pp. 1–22). Rio de Janeiro: World Conference on Social Determinants of Health.
- Mutale, W., Ayles, H., Bond, V., Mwanamwenge, M. T., & Balabanova, D. (2013). Measuring health workers' motivation in rural health facilities: Baseline results from three study districts in Zambia. *Human Resources for Health*, 11(1), 8. <http://doi.org/10.1186/1478-4491-11-8>
- Mwai, G. W., Mburu, G., Torpey, K., Frost, P., Ford, N., & Seeley, J. (2013). Role and outcomes of community health workers in HIV care in sub-Saharan Africa: A systematic review. *Journal of the International AIDS Society*, 16(1). <http://doi.org/10.7448/IAS.16.1.18586>
- Naimoli, J. F., Frymus, D. E., Wuliji, T., Franco, L. M., & Newsome, M. H. (2014). A Community Health Worker “logic model”: towards a theory of enhanced performance in low- and middle-income countries. *Human Resources for Health*, 12, 56. <http://doi.org/10.1186/1478-4491-12-56>
- News, Z. (2016, July 8). Mozambique unveils austerity plan as economic prospects darken. Retrieved July 21, 2016, from <http://zitamar.com/mozambique-unveils-austerity-plan-economic-prospects-darken/>
- Nguyen, T. A., Oosterhoff, P., Pham, Y., Hardon, A., & Wright, P. (2009). Health workers' views on quality of prevention of mother-to-child transmission and postnatal care for HIV-infected women and their children. *Human Resources for Health*, 7(1), 39.
- Nuwagaba-Biribonwoha, H., Mayon-White, R. T., Okong, P., & Carpenter, L. M. (2007). Challenges faced by health workers in implementing the prevention of mother-to-child HIV transmission (PMTCT) programme in Uganda. *Journal of Public Health*, 29(3), 269–274. <http://doi.org/10.1093/pubmed/fdm025>
- Okello, D. R. O., & Gilson, L. (2015). Exploring the influence of trust relationships on motivation in the health sector: a systematic review. *Human Resources for Health*, 13, 16. <http://doi.org/10.1186/s12960-015-0007-5>

- Pasquet, A., Messou, E., Gabillard, D., Minga, A., Depoulosky, A., Deuffic-Burban, S., et al. (2010). Impact of drug stock-outs on death and retention to care among HIV-infected patients on combination antiretroviral therapy in Abidjan, Côte d'Ivoire. *PLoS ONE*, 5(10), e13414.
- Paul, E., Sossouhounto, N., & Eclou, D. S. (2014). Local stakeholders' perceptions about the introduction of performance-based financing in Benin: a case study in two health districts. *International Journal of Health Policy and Management*, 3(4), 207–214. <http://doi.org/10.15171/ijhpm.2014.93>
- Peltzer, K., Phaswana-Mafuya, N., & Ladzani, R. (2010). Implementation of the national programme for prevention of mother-to-child transmission of HIV: a rapid assessment in Cacadu district, South Africa. *African Journal of AIDS Research*, 9(1), 95–106.
- Perez, F., Aung, K., Ndoro, T., Engelsmann, B., & Dabis, F. (2008). Participation of traditional birth attendants in prevention of mother-to-child transmission of HIV services in two rural districts in Zimbabwe: A feasibility study. *BMC Public Health*, 8, 401.
- Pfeiffer, J. (2003). International NGOs and primary health care in Mozambique: the need for a new model of collaboration. *Social Science & Medicine* (1982), 56(4), 725–738.
- Pfeiffer, J., & Chapman, R. (2015). The art of medicine: an anthropology of aid in Africa. *The Lancet*, 385(9983), 2144–2145. [http://doi.org/10.1016/S0140-6736\(15\)61013-3](http://doi.org/10.1016/S0140-6736(15)61013-3)
- Pfeiffer, J., Montoya, P., Baptista, A. J., Karagianis, M., Pugas, M. de M., Micek, M., et al. (2010). Integration of HIV/AIDS services into African primary health care: lessons learned for health system strengthening in Mozambique - a case study. *Journal of the International AIDS Society*, 13(1), 3. <http://doi.org/10.1186/1758-2652-13-3>
- Piwoz, E. G., Ferguson, Y. O., Bentley, M. E., Corneli, A. L., Moses, A., Nkhoma, J., et al. (2006). Differences between international recommendations on breastfeeding in the presence of HIV and the attitudes and counseling messages of health workers in Lilongwe, Malawi. *International Breastfeeding Journal*, 1(1), 2. <http://doi.org/10.1186/1746-4358-1-2>
- Priedeman Skiles, M., Curtis, S. L., Basinga, P., & Angeles, G. (2012). An equity analysis of performance-based financing in Rwanda: are services reaching the poorest women? *Health Policy and Planning*. <http://doi.org/10.1093/heapol/czs122>
- Rajkiotia, Y., Zang, O., Nguimkeu, P., & Djurovic, I. (2015). Has performance-based financing accelerated progress towards controlling the HIV epidemic? An impact evaluation of Mozambique's HIV-focused PBF programme, 18(Suppl 4), 88.
- Ramjee, G., & Daniels, B. (2013). Women and HIV in sub-Saharan Africa. *AIDS Research and Therapy*, 10, 30. <http://doi.org/10.1186/1742-6405-10-30>
- Rispel, L. C., Peltzer, K., Phaswana-Mafuya, N., Metcalf, C. A., & Treger, L. (2009). Assessing missed opportunities for the prevention of mother-to-child HIV transmission in an Eastern Cape local service area. *South African Medical Journal*, 99(3), 174–179.
- Rollins, N., & Coovadia, H. M. (2013). Breastfeeding and HIV transmission in the developing world: past, present, future. *Current Opinion in HIV and AIDS*, 8(5), 466–472. <http://doi.org/10.1097/COH.0b013e3283632ba2>
- Rowe, A. K., de Savigny, D., Lanata, C. F., & Victora, C. G. (2005). How can we achieve and maintain high-quality performance of health workers in low-resource settings? *The Lancet*, 366(9490), 1026–1035. [http://doi.org/10.1016/S0140-6736\(05\)67028-6](http://doi.org/10.1016/S0140-6736(05)67028-6)
- Rujumba, J., Tumwine, J. K., Tylleskär, T., Neema, S., & Heggenhougen, H. K. (2012). Listening to health workers: lessons from eastern Uganda for strengthening the programme for the prevention of mother-to-child transmission of HIV. *BMC Health Services Research*, 12, 3. <http://doi.org/10.1186/1472-6963-12-3>
- Rustagi, A. S., Gimbel, S., Nduati, R., Cuembelo, M. de F., Wasserheit, J. N., Farquhar, C., et al. (2016). Impact of a systems engineering intervention on PMTCT service delivery in Côte d'Ivoire, Kenya, Mozambique. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, 1–26. <http://doi.org/10.1097/QAI.0000000000001023>
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68–78.

- Sarker, M., Papy, J., Traore, S., & Neuhaus, F. (2009). Insights on HIV pre-test counseling following scaling-up of PMTCT program in rural health posts, Burkina Faso. *East African Journal of Public Health*, 6(3), 283–289.
- Satti, H., Motsamai, S., Chetane, P., Marumo, L., Barry, D. J., Riley, J., et al. (2012). Comprehensive approach to improving maternal health and achieving MDG 5: report from the mountains of Lesotho. *PLoS ONE*, 7(8), e42700. <http://doi.org/10.1371/journal.pone.0042700>
- Schechter, J., Bakor, A. B., Kone, A., Robinson, J., Lue, K., & Senturia, K. (2014). Exploring loss to follow-up among women living with HIV in prevention of mother to child transmission programmes in Côte d'Ivoire. *Global Public Health*, 9(10), 1139–1151. <http://doi.org/10.1080/17441692.2014.970659>
- Schuster, R. C., de Sousa, O., Rivera, J., Olson, R., Pinault, D., & Young, S. L. (2016a). Performance-based incentives hold potential to improve delivery of prevention of vertical transmission of HIV services in rural Mozambique. *Under Review*.
- Schuster, R. C., McMahon, D. E., & Young, S. L. (2016b). *A comprehensive review of the barriers and promoters health workers experience in delivering prevention of vertical transmission of HIV services in sub-Saharan Africa*. *AIDS Care* (Vol. In press). Under Review.
- Shah, S. (2005). Breastfeeding knowledge among health workers in rural South Africa. *Journal of Tropical Pediatrics*, 51(1), 33–38. <http://doi.org/10.1093/tropej/fmh071>
- Shayo, E. H., Mboera, L. E., & Blystad, A. (2013). Stakeholders' participation in planning and priority setting in the context of a decentralised health care system: the case of prevention of mother to child transmission of HIV programme in Tanzania. *BMC Health Services Research*, 13, 273. <http://doi.org/10.1186/1472-6963-13-273>
- Sherr, K., Gimbel, S., Rustagi, A., Nduati, R., Cuembelo, F., Farquhar, C., et al. (2014). Systems analysis and improvement to optimize pMTCT (SAIA): a cluster randomized trial. *Implementation Science*, 9, 55. <http://doi.org/10.1186/1748-5908-9-55>
- Sherr, K., Mussa, A., Chilundo, B., Gimbel, S., Pfeiffer, J., Hagopian, A., & Gloyd, S. (2012). Brain drain and health workforce distortions in Mozambique. *PLoS ONE*, 7(4), e35840.
- Siemens, E., Roth, A., & Balasubramanian, S. (2008). How motivation, opportunity, and ability drive knowledge sharing: The constraining-factor model. *Journal of Operations Management*, 26(3), 426–445. <http://doi.org/10.1016/j.jom.2007.09.001>
- Silal, S. P., Penn-Kekana, L., Harris, B., Birch, S., & McIntyre, D. (2012). Exploring inequalities in access to and use of maternal health services in South Africa. *BMC Health Services Research*, 12, 120. <http://doi.org/10.1186/1472-6963-12-120>
- Simba, D., Kamwela, J., Mpembeni, R., & Msamanga, G. (2008). The impact of scaling-up prevention of mother-to-child transmission (PMTCT) of HIV infection on the human resource requirement: the need to go beyond numbers. *The International Journal of Health Planning and Management*, 25, 17–29. <http://doi.org/10.1002/hpm.950>
- Simon, S., Chu, K., Frieden, M., Candrinho, B., Ford, N., Schneider, H., & Biot, M. (2009). An integrated approach of community health worker support for HIV/AIDS and TB care in Angónia district, Mozambique. *BMC International Health and Human Rights*, 9, 13. <http://doi.org/10.1186/1472-698X-9-13>
- Soeters, R., Peerenboom, P. B., Mushagalusa, P., & Kimanuka, C. (2011). Performance-based financing experiment improved health care in the Democratic Republic of Congo. *Health Affairs (Project Hope)*, 30(8), 1518–1527. <http://doi.org/10.1377/hlthaff.2009.0019>
- Spisak, C., & Morgan, L. (2014). *Use of incentives in health supply chains: a review of results-based financing in Mozambique's central medical store* (pp. 1–54). Arlington, VA: USAID | Deliver Project.
- Spisak, C., Morgan, L., Eichler, R., Rosen, J., Serumaga, B., & Wang, A. (2016). Results-Based Financing in Mozambique's Central Medical Store: A Review After 1 Year. *Global Health: Science and Practice*, e-ghsp-d-15-00173. <http://doi.org/10.9745/GHSP-D-15-00173>
- Sprague, C., Chersich, M. F., & Black, V. (2011). Health system weaknesses constrain access to PMTCT

- and maternal HIV services in South Africa. *AIDS Research and Therapy*, 8(1), 10.  
<http://doi.org/10.1186/1742-6405-8-10>
- Ssengooba, F., McPake, B., & Palmer, N. (2012). Why performance-based contracting failed in Uganda – An “open-box” evaluation of a complex health system intervention. *Social Science & Medicine*, 75(2), 377–383. <http://doi.org/10.1016/j.socscimed.2012.02.050>
- Stinson, K., & Myer, L. (2012). Barriers to initiating antiretroviral therapy during pregnancy: a qualitative study of women attending services in Cape Town, South Africa. *African Journal of AIDS Research*, 11(1), 65–73. <http://doi.org/10.2989/16085906.2012.671263>
- Strachan, D. L., Kallander, K., Nakirunda, M., Ndima, S., Muiambo, A., Hill, Z., inSCALE study group. (2015). Using theory and formative research to design interventions to improve community health worker motivation, retention and performance in Mozambique and Uganda. *Human Resources for Health*, 13(1), 25. <http://doi.org/10.1186/s12960-015-0020-8>
- Sturke, R., Harmston, C., Simonds, R. J., Mofenson, L. M., Siberry, G. K., Watts, H., et al. (2014). A multi-disciplinary approach to implementation science: the NIH-PEPFAR PMTCT Implementation Science Alliance. *Journal of Acquired Immune Deficiency Syndromes*, 67(Suppl2), S163–67. <http://doi.org/10.1097/QAI.0000000000000323>
- Tomlinson, M., Doherty, T., Ijumba, P., Jackson, D., Lawn, J., Persson, L. A., et al. (2014). Goodstart: a cluster randomised effectiveness trial of an integrated, community-based package for maternal and newborn care, with prevention of mother-to-child transmission of HIV in a South African township. *Tropical Medicine & International Health*, 19(3), 256–266. <http://doi.org/10.1111/tmi.12257>
- Topp, S. M., Chipukuma, J. M., & Hanefeld, J. (2015). Understanding the dynamic interactions driving Zambian health centre performance: a case-based health systems analysis. *Health Policy and Planning*, 30(4), 485–499. <http://doi.org/10.1093/heapol/czu029>
- Touré, H., Audibert, M., & Dabis, F. (2010). To what extent could performance-based schemes help increase the effectiveness of prevention of mother-to-child transmission of HIV (PMTCT) programs in resource-limited settings? A summary of the published evidence. *BMC Public Health*, 10(1), 702. <http://doi.org/10.1186/1471-2458-10-702>
- Turan, J. M., & Nyblade, L. (2013). HIV-related stigma as a barrier to achievement of global PMTCT and maternal health goals: a review of the evidence. *AIDS and Behavior*, 17(7), 2528–2539. <http://doi.org/10.1007/s10461-013-0446-8>
- Turan, J. M., Hatcher, A. H., Medema-Wijnveen, J., Onono, M., Miller, S., Bukusi, E. A., et al. (2012). The role of HIV-related stigma in utilization of skilled childbirth services in rural Kenya: a prospective mixed-methods study. *PLoS Medicine*, 9(8), e1001295. <http://doi.org/10.1371/journal.pmed.1001295>
- Tuthill, E., McGrath, J., & Young, S. (2013). Commonalities and differences in infant feeding attitudes and practices in the context of HIV in sub-Saharan Africa: A metasynthesis. *AIDS Care*, 26(2), 214–225. <http://doi.org/10.1080/09540121.2013.813625>
- UNAIDS. (2011). How to get to zero: Faster. Smarter. Better., 1–52.
- UNAIDS. (2012). *Global Report: UNAIDS Report on the Global AIDS Epidemic* (pp. 1–110). Geneva.
- UNAIDS. (2014a). *Mozambique: 2014 progress report on the global plan* (pp. 1–4). Geneva: Joint United Nations Programme on HIV/AIDS.
- UNAIDS. (2014b). *The gap report* (pp. 1–422). Geneva: Joint United Nations Programme on HIV/AIDS.
- Underwood, C., Skinner, J., Osman, N., & Schwandt, H. (2011). Structural determinants of adolescent girls’ vulnerability to HIV: views from community members in Botswana, Malawi, and Mozambique. *Social Science & Medicine*, 73(2), 343–350. <http://doi.org/10.1016/j.socscimed.2011.05.044>
- UNICEF. (2013). *Improving child nutrition: the achievable imperative for global progress* (pp. 1–132). New York: United Nations Children's Fund.
- United Nations AIDS Programme. (2014). *Mozambique: 2014 progress report on the global plan* (pp. 1–36).
- Uwimana, J., Jackson, D., Hausler, H., & Zarowsky, C. (2012a). Health system barriers to



- implementation of collaborative TB and HIV activities including prevention of mother to child transmission in South Africa. *Tropical Medicine & International Health*, 17(5), 658–665.  
<http://doi.org/10.1111/j.1365-3156.2012.02956.x>
- Uwimana, J., Zarowsky, C., Hausler, H., & Jackson, D. (2012b). Engagement of non-government organisations and community care workers in collaborative TB/HIV activities including prevention of mother to child transmission in South Africa: Opportunities and challenges. *BMC Health Services Research*, 12(1), 1–1. <http://doi.org/10.1186/1472-6963-12-233>
- Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: implications for conducting a qualitative descriptive study. *Nursing & Health Sciences*, 15(3), 398–405.  
<http://doi.org/10.1111/nhs.12048>
- Vernooij, E., & Hardon, A. (2013). “What mother wouldn't want to save her baby?” HIV testing and counseling practices in a rural Ugandan antenatal clinic. *Culture, Health & Sexuality*, 15(sup4), S553–S566. <http://doi.org/10.1080/13691058.2012.758314>
- Wanyu, B., Diom, E., Mitchell, P., Tih, P., & Meyer, D. (2007). Birth attendants trained in “prevention of mother-to-child HIV transmission” provide care in rural Cameroon, Africa. *Journal of Midwifery & Women's Health*, 52(4), 334–341. <http://doi.org/10.1016/j.jmwh.2006.12.018>
- Watson-Jones, D., Balira, R., Ross, D. A., Weiss, H. A., & Mabey, D. (2012). Missed opportunities: poor linkage into ongoing care for HIV-positive pregnant women in Mwanza, Tanzania. *PLoS ONE*, 7(7), e40091. <http://doi.org/10.1371/journal.pone.0040091>
- Waweru, E., Goodman, C., Keding, S., Tsofa, B., & Molyneux, S. (2016). Tracking implementation and (un)intended consequences: a process evaluation of an innovative peripheral health facility financing mechanism in Kenya. *Health Policy and Planning*, 31(2), 137–147.  
<http://doi.org/10.1093/heapol/czv030>
- Wernau, J., & Wirz, M. (2016, April 27). World Bank is suspending direct financial aid to Mozambique.
- WHO. (2006a). *Antiretroviral drugs for treating pregnant women and preventing HIV infection in infants in resource-limited settings: towards universal access* (pp. 1–89). Geneva: World Health Organization.
- WHO. (2006b). Managing exits from the workforce. In WHO (Ed.), *World health report* (pp. 96–117).
- WHO. (2007a). *HIV and infant feeding* (pp. 1–20). Geneva.
- WHO. (2007b). *Strengthening health systems to improve health outcomes: WHO's framework for action*. (WHO, Ed.) (pp. 1–56). Geneva.
- WHO. (2010). *Guidelines on HIV and infant feeding 2010* (pp. 1–58). Geneva: World Health Organization.
- WHO. (2012a). Mozambique: Health financing. Retrieved April 29, 2016, from <http://www.afro.who.int/en/mozambique/country-programmes/health-systems/health-financing.html>
- WHO. (2012b). *Programmatic update: Use of antiretroviral drugs for treating pregnant women and preventing HIV infection in infants*. (World Health Organization, Ed.) (pp. 1–7). Geneva.
- WHO. (2015). *Guideline on when to start antiretroviral therapy and on pre-exposure prophylaxis for HIV* (pp. 1–78). Geneva: World Health Organization.
- Witter, S., Fretheim, A., Kessy, F., & Lindahl, A. (2012). Paying for performance to improve the delivery of health interventions in low- and middle-income countries (Review). *The Cochrane Database of Systematic Reviews*, 1–83.
- Witter, S., Toonen, J., Meessen, B., Kagubare, J., Fritsche, G., & Vaughan, K. (2013). Performance-based financing as a health system reform: mapping the key dimensions for monitoring and evaluation. *BMC Health Services Research*, 13(1), 367. <http://doi.org/10.1186/1472-6963-13-367>
- World Health Organization. (2008). *Task shifting: rational redistribution of tasks among health workforce teams* (pp. 1–96). Geneva.
- World Health Organization. (2013). *Consolidated guidelines on general HIV care and the use of antiretroviral drugs for treating and preventing HIV infection: recommendations for a public health approach* (p. 269). Geneva: World Health Organization.
- World Health Organization. (2015). *World health statistics 2015* (pp. 1–161). World Health Organization.

- Yeap, A. D., Hamilton, R., Charalambous, S., Dwadwa, T., Churchyard, G. J., Geissler, P. W., & Grant, A. D. (2010). Factors influencing uptake of HIV care and treatment among children in South Africa – a qualitative study of caregivers and clinic staff. *AIDS Care*, 22(9), 1101–1107. <http://doi.org/10.1080/09540121003602218>
- Yé, M., Diboulo, E., Kagoné, M., Sié, A., Sauerborn, R., & Loukanova, S. (2016). Health worker preferences for performance-based payment schemes in a rural health district in Burkina Faso. *Global Health Action*, 9(0), 1–12. <http://doi.org/10.3402/gha.v9.29103>